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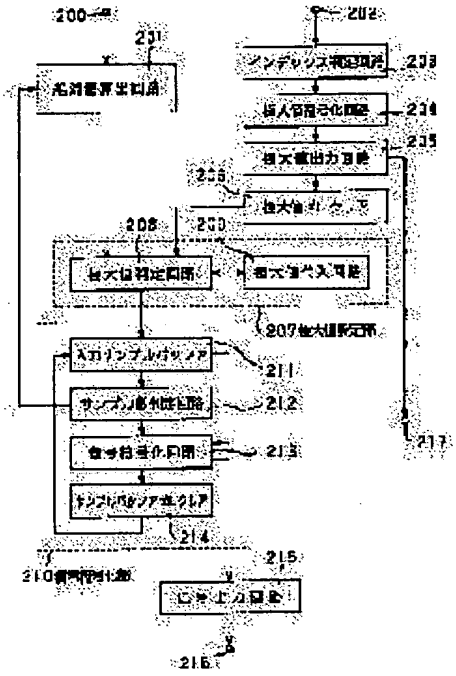
(54) METHOD AND DEVICE FOR SIGNAL PROCESSING AND SIGNAL RECORDING MEDIUM

(57)Abstract:
PURPOSE: To effectively switch the reproduction levels in the reduced frequency even for reproduction of plural signals by recording or transmiting the maximum level of each partial signal together with an actual signal.
CONSTITUTION: An absolute value calculation circuit 201 calculates the absolute value of the time series sample data, i.e., the actual signal supplied from a terminal 200 and sends this absolute value to a maximum value deciding circuit 208 of a maximum value setting part 207 together with the supplied sample data. A maximum value coding circuit 204 detects the maximum value to an index out of the sample data supplied from the terminal 200 and codes this maximum value to send it to a maximum value output circuit 205. In a reproduction state, the maximum value of the circuit 205 is compared with the maximum value of the partial signal to be reproduced. If the former maximum value is larger than the latter value, the level of the relevant part is automatically set at the level of the partial signal of the maximum value for reproduction of the signal. Thus the reproduction levels can be effectively switched.



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CLAIMS

[Claim(s)]
[Claim 1]A signal processing method detecting the maximal value of a signal level about each partial signal of a real signal which consists of two or more partial signals in a signal processing method of a real signal which consists of two or more partial signals, and recording or transmitting the above-mentioned maximal value about each partial signal with the above-mentioned real signal.
[Claim 2]The signal processing method according to claim 1 using logical sum of an absolute value of the above-mentioned partial signal as an approximate value of the above-mentioned maximal value.
[Claim 3]The signal processing method according to claim 1 or 2 coding to the maximal value recorded or transmitted.
[Claim 4]A signal recording medium which records a signal processed by any 1 paragraph of claim 1 to the claims 3 using a signal processing method of a statement, and is characterized by things.
[Claim 5]A signal processing method detecting the maximal value of a signal level about each partial signal of a real signal which consists of two or more partial signals, and recording or transmitting the above-mentioned maximal value about each partial signal with a coded real signal in a signal processing method of a real signal which consists of two or more partial signals.
[Claim 6]The signal processing method according to claim 5 using logical sum of an absolute value of the above-mentioned partial signal as an approximate value of the above-mentioned maximal value.
[Claim 7]The signal processing method according to claim 5 or 6 coding to the maximal value recorded or transmitted.
[Claim 8]A signal recording medium which records a signal processed by any 1 paragraph of claim 5 to the claims 7 using a signal processing method of a statement, and is characterized by things.
[Claim 9]It is a signal processing method which reproduces a signal recorded or transmitted using the signal processing method according to claim 1 or 2, Reproduction of a real signal which consists of two or more partial signals with which record or transmission was made is preceded, A signal processing method multiplying by a value which detected the maximum in inside of the maximal value with which record or transmission of a signal level about each partial signal was made, and **(ed) the detected maximum concerned with the maximal value of each partial signal for every partial signal at the time of reproduction of a real signal.
[Claim 10]It is a signal processing method which reproduces a signal recorded or transmitted using the signal processing method according to claim 3, In advance of reproduction of a real signal which consists of two or more partial signals with which record or transmission was made, the coded maximal value with which record or transmission of a signal level about each partial signal was made is decrypted, A signal processing method multiplying by a value which detected the maximum in inside of each decrypted maximal value concerned, and **(ed) the detected maximum concerned with the maximal value of each partial signal for every partial signal at the time of reproduction of a real signal.
[Claim 11]It is a signal processing method which reproduces a signal recorded or transmitted using the signal processing method according to claim 5 or 6, Reproduction of a real signal which consists of a coded partial signal of plurality by which record or transmission was made is preceded, A signal processing method multiplying by a value which detected the maximum in inside of the maximal value with which record or transmission of a signal level about each partial signal was made, and **(ed) the detected maximum concerned with the maximal value of each partial signal for each [which was decrypted at the time of reproduction of a real signal] partial signal of every.
[Claim 12]It is a signal processing method which reproduces a signal recorded or transmitted using the signal

processing method according to claim 7, In advance of reproduction of a real signal which consists of a coded partial signal of plurality by which record or transmission was made, the coded maximal value with which record or transmission of a signal level about each partial signal was made is decrypted, A signal processing method multiplying by a value which detected the maximum in inside of each decrypted maximal value concerned, and **(ed) the detected maximum concerned with the maximal value of each partial signal for each [which was decrypted at the time of reproduction of a real signal] partial signal of every.
[Claim 13]A signal processing method given in any 1 paragraph of claim 9 to the claims 12 characterized by using a bit shift as the multiplication concerned using a value of a exponentiation of 2 as an approximate value of a multiplier by which each above-mentioned partial signal is multiplied.
[Claim 14]A signal processor having a detection means to detect the maximal value of a signal level about each partial signal of a real signal which consists of two or more partial signals in a signal processor of a real signal which consists of two or more partial signals, and recording or transmitting the above-mentioned maximal value about each partial signal with the above-mentioned real signal.
[Claim 15]The signal processor according to claim 14 using logical sum of an absolute value of the above-mentioned partial signal as an approximate value of the above-mentioned maximal value.
[Claim 16]The signal processor according to claim 14 or 15 establishing an encoding means which codes to the maximal value recorded or transmitted.
[Claim 17]It has a detection means to detect the maximal value of a signal level about each partial signal of a real signal which consists of two or more partial signals in a signal processor of a real signal which consists of two or more partial signals, A signal processor recording or transmitting the above-mentioned maximal value about each partial signal with a coded real signal.
[Claim 18]The signal processor according to claim 17 using logical sum of an absolute value of the above-mentioned partial signal as an approximate value of the above-mentioned maximal value.
[Claim 19]The signal processor according to claim 17 or 18 establishing an encoding means which codes to the maximal value recorded or transmitted.
[Claim 20]A signal processor which reproduces a signal recorded or transmitted using the signal processing method according to claim 1 or 2, comprising:
A detection means to detect the maximum in inside of the maximal value with which record or transmission of a signal level about each partial signal was made in advance of reproduction of a real signal which consists of two or more partial signals with which record or transmission was made.
A multiplication means which multiplies by a value which **(ed) the detected maximum concerned with the maximal value of each partial signal for every partial signal at the time of reproduction of a real signal.

[Claim 21]A signal processor which reproduces a signal recorded or transmitted using the signal processing method according to claim 3, comprising:
A detection means to decrypt the coded maximal value with which record or transmission of a signal level about each partial signal was made in advance of reproduction of a real signal which consists of two or more partial signals with which record or transmission was made, and to detect the maximum in inside of each decrypted maximal value concerned.
A multiplication means which multiplies by a value which **(ed) the detected maximum concerned with the maximal value of each partial signal for every partial signal at the time of reproduction of a real signal.

[Claim 22]A signal processor which reproduces a signal recorded or transmitted using the signal processing method according to claim 5 or 6, comprising:
A detection means to detect the maximum in inside of the maximal value with which record or transmission of a signal level about each partial signal was made in advance of reproduction of a real signal which consists of a coded partial signal of plurality by which record or transmission was made.
A multiplication means which decrypted a value which **(ed) the detected maximum concerned with the maximal value of each partial signal at the time of reproduction of a real signal and by which it multiplies for every partial signal.

[Claim 23]A signal processor which reproduces a signal recorded or transmitted using the signal processing method according to claim 7, comprising:
A detection means to decrypt the coded maximal value with which record or transmission of a signal level

about each partial signal was made in advance of reproduction of a real signal which consists of a coded partial signal of plurality by which record or transmission was made, and to detect the maximum in inside of each decrypted maximal value concerned.
A multiplication means which decrypted a value which **(ed) the detected maximum concerned with the maximal value of each partial signal at the time of reproduction of a real signal and by which it multiplies for every partial signal.

[Claim 24]A signal processor given in any 1 paragraph of claim 20 to the claims 23 characterized by using a bit shift as the multiplication concerned using a value of a exponentiation of 2 as an approximate value of a multiplier by which the above-mentioned partial signal is multiplied.
[Claim 25]It is a signal processor which reproduces claims 1, 2, and 5 or a signal recorded or transmitted using a signal processing method given in six, Reproduction of a real signal which consists of two or more partial signals with which record or transmission was made is preceded, Have a control means to which the maximal value with which record or transmission of a signal level about each partial signal was made is supplied, and the control means concerned, A signal processor detecting the maximum in inside of the above-mentioned maximal value, and controlling a regeneration level in analog for every partial signal according to the maximal value and the maximum of each partial signal at the time of reproduction of a real signal.
[Claim 26]It is a signal processor which reproduces a signal recorded or transmitted using the signal processing method according to claim 3 or 7, Reproduction of a real signal which consists of two or more partial signals with which record or transmission was made is preceded, Have a control means to which the coded maximal value with which record or transmission of a signal level about each partial signal was made is supplied, and the control means concerned, A signal processor decrypting the above-mentioned maximal value, detecting the maximum in inside of each decrypted maximal value concerned, and controlling a regeneration level in analog for every partial signal according to the maximal value and the maximum of each partial signal at the time of reproduction of a real signal.
[Claim 27]A signal processor which is provided with the following and characterized by the control means concerned controlling a regeneration level in analog for every partial signal according to the maximal value and the maximum of each partial signal at the time of reproduction of a real signal.
It is a signal processor which reproduces claims 1, 2, and 5 or a signal recorded or transmitted using a signal processing method given in six, A detection means to detect the maximal value with which record or transmission of a signal level about each partial signal was made, and the maximum in inside of each maximal value concerned in advance of reproduction of a real signal which consists of two or more partial signals with which record or transmission was made.
A control means to which a detect output of the above-mentioned detection means is supplied.

[Claim 28]A signal processor which is provided with the following and characterized by the control means concerned controlling a regeneration level in analog for every partial signal according to the maximal value and the maximum of each partial signal at the time of reproduction of a real signal.
It is a signal processor which reproduces a signal recorded or transmitted using the signal processing method according to claim 3 or 7, A decoding means which decrypts the coded maximal value with which record or transmission of a signal level about each partial signal was made in advance of reproduction of a real signal which consists of two or more partial signals with which record or transmission was made.
A detection means to detect the maximum in inside of each maximal value concerned from an output of the decoding means concerned.
A control means to which a detect output of the above-mentioned detection means is supplied.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application]This invention relates digital signals, such as music and a sound, to record, the signal processing method at the time of transmitting or playing, its device, and the signal recording medium with which the signal processed with this signal processing method is recorded, for example.
[0002]
[Description of the Prior Art]When recording signals, such as music and a sound, from before, for example to archive media, such as what is called a compact disk (CD) (sound recording), the levels of the sound recording usually differ separately. That is, in the compact disk of two or more sheets, the levels of the signal recorded for every disk will differ.
[0003]For this reason, the music etc. of two or more music played, for example from the compact disk (CD) of two or more sheets, etc., For example, since the levels of the signal played from each compact disk as mentioned above differed when it recorded on the disk of one sheet etc. in which record reproduction is possible, When playing the disk of one sheet which recorded two or more music concerned, a user needs to change a regeneration level for every music, or it is necessary to control.
[0004]
[Problem(s) to be Solved by the Invention]Namely, the music and the sound which were recorded on the inside of one recording medium when become common and stated, Or when the music and the sound which were transmitted from one transmission medium are divided into some portions and the levels recorded or transmitted for every portion differ (for example, when divided for every music), it is necessary to change a regeneration level for every portion in the case of the playback.
[0005]Therefore, the switching action of a level must be frequently performed at the time of reproduction, operation becomes very complicated, and the burden of the user concerned is increasing the user.
[0006]Then, even when reproducing the signal which this invention was made in view of such the actual condition, and was divided into two or more portions, and was recorded or transmitted. a user does not need to perform the switching action of a regeneration level frequently, but it aims at providing the signal processing method which enables the change of a regeneration level effectively, a device, and a signal recording medium.
[0007]
[Means for Solving the Problem]This invention is proposed in order to attain the above-mentioned purpose, and a signal processing method of this invention, It is a signal processing method of a real signal which consists of two or more partial signals, the maximal value of a signal level about each partial signal is detected, and the above-mentioned maximal value is recorded or transmitted with the above-mentioned real signal. Here, it should code and logical sum of an absolute value of the above-mentioned partial signal can be used for a real signal and the maximal value which are recorded or transmitted as an approximate value of the above-mentioned maximal value.
[0008]Next, a signal recording medium of this invention records a signal processed by a signal processing method of above-mentioned this invention.
[0009]In a signal processing method which reproduces a signal which was processed using a signal processing method of this invention, and was recorded or transmitted. According to a signal processing method at the time of the above-mentioned record or transmission, reproduction of a real signal by which record or transmission was made is preceded, The maximum in inside of the maximal value with which record or

transmission of a signal level about each partial signal was made is detected, and it performs multiplying by a value which **(ed) the detected maximum concerned with the maximal value of each partial signal for every partial signal at the time of reproduction of a real signal. When the maximal value with which record or transmission was made is coded, The maximal value coded [above-mentioned] is decrypted in advance of reproduction of a real signal, the maximum in inside of each decrypted maximal value concerned is detected, and it performs multiplying by a value which **(ed) the maximum with the maximal value of each partial signal for every partial signal at the time of reproduction of a real signal. In advance of reproduction of a coded real signal, the maximum in inside of the maximal value with which record or transmission of a signal level about each partial signal was made is detected, and it multiplies by a value which **(ed) the detected maximum concerned with the maximal value of each partial signal for each [which was decrypted at the time of reproduction of a real signal] partial signal of every. When both a real signal and the maximal value are coded, In advance of reproduction of a coded real signal, the coded maximal value with which record or transmission of a signal level about a partial signal was made is decrypted, The maximum in inside of each decrypted maximal value concerned is detected, and it performs multiplying by a value which **(ed) the detected maximum concerned with the maximal value of each partial signal for each [which was decrypted at the time of reproduction of a real signal] partial signal of every.

[0010]In a signal processing method of this invention, a bit shift can be used as the multiplication concerned, using a value of a exponentiation of 2 as an approximate value of a multiplier by which each above-mentioned partial signal is multiplied.

[0011]Next, a signal processor of this invention has a detection means to be a signal processor of a real signal which consists of two or more partial signals, and to detect the maximal value of a signal level about each partial signal of a real signal, and records or transmits the above-mentioned maximal value with the above-mentioned real signal. A real signal and the maximal value which are recorded or transmitted also with a signal processor of this invention should be coded. Logical sum of an absolute value of each above-mentioned partial signal can be used as an approximate value of the above-mentioned maximal value.

[0012]A signal processor which reproduces a signal which was processed using a signal processing method of this invention, and was recorded or transmitted is provided with the following.

A detection means to detect the maximum in inside of the maximal value with which record or transmission of a signal level about each partial signal was made in advance of reproduction of a real signal by which record or transmission was made.

A multiplication means which multiplies by a value which **(ed) the detected maximum concerned with the maximal value of each partial signal for every partial signal at the time of reproduction of a real signal.

A detection means detects the maximum in inside of each of that maximal value, after decrypting the maximal value by which a signal level about each partial signal was coded, when the maximal value recorded or transmitted is coded by **. When a real signal recorded or transmitted is coded, it multiplies by a multiplication means for each [which decrypted a value which **(ed) the maximum detected by a detection means with the maximal value of each partial signal at the time of reproduction of a real signal] partial signal of every. When both a real signal and the maximal value are coded, The coded maximal value with which record or transmission was made in a detection means is decrypted, the maximum in inside of each decrypted maximal value concerned is detected, and it multiplies by a value which **(ed) the detected maximum concerned with the maximal value of each partial signal in a multiplication means for each [which was decrypted at the time of reproduction of a real signal] partial signal of every.

[0013]Also in a signal processor of this invention, a bit shift can be used as the multiplication concerned, using a value of a exponentiation of 2 as an approximate value of a multiplier by which each above-mentioned partial signal is multiplied.

[0014]A signal processor of this invention which reproduces a signal which was processed using a signal processing method of this invention, and was recorded or transmitted, Reproduction of a real signal which can also control a regeneration level in analog for example, by which record or transmission was made is preceded, It has a control means to which the maximal value with which record or transmission of a signal level about each partial signal was made is supplied, and the control means concerned detects the maximum in inside of the above-mentioned maximal value, and controls a regeneration level in analog for every partial signal according to the maximal value and the maximum of each partial signal at the time of reproduction of a real signal. To this signal processor that controls a regeneration level in analog. A detection means to detect the maximal value with which record or transmission of a signal level about each partial signal was made, and the

maximum in inside of each maximal value concerned is formed, According to the maximal value and the maximum of each partial signal which were detected by the above-mentioned detection means, a regeneration level is also controllable by a control means in analog for every partial signal at the time of reproduction of a real signal.
[0015]When the maximal value with which record or transmission is made is coded in a signal processor of this invention which controls a regeneration level in analog, This coded maximal value is supplied to a control means, the control means concerned decrypts the above-mentioned maximal value, the maximum in inside of each decrypted maximal value concerned is detected, and what controls a regeneration level in analog for every partial signal at the time of reproduction of a real signal is considered according to the maximal value and the maximum of each partial signal. The coded maximal value is also being able to decrypt by a decoding means and detecting the maximum in inside of each maximal value concerned from an output of the decoding means concerned by a detection means further, before ******(ing) to a control means today, A control means controls a regeneration level in analog for every partial signal according to this maximal value and maximum that were detected at the time of reproduction of a real signal.
[0016]
[Function]When performing the record or transmission of a real signal which consists of two or more partial partial signals according to the signal processing method and device of this invention, Detect the maximal value of the signal level about each partial signal, record or transmit this maximal value with the real signal, and at the time of reproduction The maximum of that maximal value, The maximal value of the partial signal to reproduce is compared, and when the maximal value of the partial signal to reproduce is smaller, he is trying to reproduce the level of the portion together with the level of the partial signal of the maximum automatically.
[0017]According to the signal recording medium of this invention, since the maximal value of the signal level about each partial signal is recorded with the real signal, the maximal value can be used for the level control at the time of reproduction.
[0018]
[Example]Hereafter, the desirable example of this invention is described, referring to drawings.
[0019]Drawing 1 is a flow chart which shows the explanation of operation at the time of performing the record or transmission of a signal in the signal processor with which the signal processing method of this invention is applied. From Step S2 of this drawing 1 to step S9 expresses down stream processing of operation of an important section.
[0020]In this drawing 1, the time series sample data of a sound or music is inputted as a real signal at the first step S1. The terminal input from the thing read in the recording medium or another device, etc. may be used for the input of a signal here, and the method in particular of the input concerned cannot be limited, but can apply various methods.
[0021]The index with which the sample data of the time series inputted [above-mentioned] expresses with the following step S2 whether it is what is contained in the portion of what position of the whole judges whether it changed with the time of a front sample. This index can be considered to be the same thing as the index of Q data format of said compact disk, therefore can mention digital signals, such as musical music, as an example as the above-mentioned portion. Limitation in particular of in what kind of form the index concerned is inputted like the case of the above-mentioned time series sample data is not performed. In this step S2, when it judges with not changing to the following step S3 again when it judges with the above-mentioned index changing (yes) (no), it progresses to Step S6.
[0022]In Step S3, when it judges whether the present index is "1" and judges with it being "1" (yes), it progresses to Step S6, and when it judges with it not being "1" (no), it progresses to step S4.
[0023]In step S4, the maximal value of each sample data corresponding to the index in front of the present one, i.e., a partial signal, is outputted, and it progresses to the following step S5. In the step S5 concerned, the zero clear of the maximal value memorized previously is carried out, and it progresses to Step S6.
[0024]In the following step S6, the maximal value is larger, or as compared with the absolute value of input sample data, in being equal (yes), he follows the maximal value memorized to Step S8, and when the maximal value is conversely smaller (no), it progresses to Step S7.
[0025]In Step S7, the absolute value of the above-mentioned input sample data is substituted for the maximal value, and it progresses to Step S8. Although it is not smaller than the absolute value of input sample data, it may be made to substitute the approximate value which is a near value instead of substituting the absolute value of input sample data for the maximal value here.

[0026]In the following step S8, input sample data are copied to an input sample buffer, and it progresses to the following step S9.
[0027]It is judged whether it is equal to sample number n beforehand set up in this step S9 for coding of the sample number stored in the above-mentioned input sample buffer, When it judges with it not being equal to the following step S10 when it judges with it being equal (yes) (no), it returns to Step S1.
[0028]In Step S10, it codes using each sample data of the above-mentioned sample number n stored in the above-mentioned input sample buffer, and progresses to the following step S11. It is also possible to use compression encoding which may be carried out to the above-mentioned n changing by the method of coding, and coding it at a time one sample as n= 1 here, and may be carried out to coding the block which makes n plurality and consists of two or more of these samples, for example, is mentioned later. or [omitting the above-mentioned step S8 and step S9 in this case by the ability also direct-recording or also transmit / not coding Step S10, but / input sample data] -- or what is necessary is just to make it consider n= 1, if it does not omit Although this example has described the example which codes, it is also considered that it is made not to code, either as mentioned above, and it does not limit especially for whether the method of coding and coding are performed here. In not coding, when outputting a signal in Step S12 mentioned later, the direct output of an input signal, i.e., the real signal, will be carried out.
[0029]In the next step S11 of the above-mentioned step S10, all the data in the used input sample buffer is transposed to 0, and it progresses to the following step S12. The coded signal is outputted in the step S12 concerned.
Then, processing is ended.
Naturally this step S12 will be skipped, when the above-mentioned step S8 and step S9 are omitted.
[0030]Next, the composition of the important section at the time of performing record or transmission in the signal processor of this invention example with which the signal processing method of this invention is applied is shown in drawing 2.
[0031]In this drawing 2, the absolute value calculation circuit 201 computes the absolute value of the time series sample data which is the real signal supplied from the terminal 200, and performs processing which sends this absolute value to the maximal value decision circuit 208 of the maximal value set part 207 with the sample data inputted [above-mentioned].
[0032]The data of the index with which the sample data inputted [above-mentioned] expresses whether it is a signal included in which portion of the whole to the index decision circuit 203, It is supplied via the terminal 202, and if the index concerned has changed with the index in front of one, processing which sends the index to the maximal value coding circuit 204 will be performed in the index decision circuit 203 concerned.
[0033]In the maximal value coding circuit 204 concerned, the maximal value to the above-mentioned index is detected from the input sample data from the above-mentioned terminal 200, the supplied maximal value is coded, this is outputted, and this is sent to the maximal value output circuit 205. Although what has various normalization coefficients etc. which are used when coding the thing which uses the number of bits of the maximal value, for example as numerals, or input sample data as the method of the coding in this maximal value coding circuit 204 can be considered, limitation in particular is not performed here. Since coding of the maximal value concerned is not indispensable conditions in this invention, it is good also as what is not performed. The flow chart of drawing 1 mentioned above shows the example which does not perform the coding concerned.
[0034]In the next maximal value output circuit 205, the maximal value obtained by processing of each sample data corresponding to the index in front of one, i.e., a partial signal, is outputted via the terminal 217, and the recognition signal which shows that the maximal value was outputted is sent to the maximal value zero-clear circuit 206.
[0035]In the maximal value zero-clear circuit 206 concerned, according to the above-mentioned recognition signal, the zero clear of the memory currently used for memory of the maximal value is carried out, and the recognition signal which shows the purport concerned that the zero clear was carried out, to the above-mentioned maximal value decision circuit 208 of the maximal value set part 207 is sent.
[0036]In the above-mentioned maximal value decision circuit 208, the maximal value obtained by processing to each sample data corresponding to the index in front of one and the absolute value output from said absolute value calculation circuit 201 are measured, When the above-mentioned maximal value is larger, the time series sample data itself sent from the above-mentioned absolute value calculation circuit 201 is sent to the input sample buffer 211 of the signal coding part 210. On the contrary, when the absolute value of this sample data

is larger, it not only sends the above-mentioned time series sample data to the above-mentioned input sample buffer 211, but it sends the absolute value concerned to the maximal value substitution circuit 209.
[0037]The inputted absolute value concerned is substituted for the maximal value substitution circuit 209 concerned to the memory allocated to the maximal value.
[0038]Although the above-mentioned maximal value decision circuit 207 and the maximal value substitution circuit 209 constitute the maximal value set part 207 which sets up the maximal value, they may be made to take the logical sum of the absolute value output of the above-mentioned absolute value calculation circuit 201 instead of these processings, and to output as an approximate value of the maximal value of this partial signal.
[0039]In the following signal coding part 210, the data of the sample number stored in the above-mentioned input sample buffer 211 is sent to the sample number decision circuit 212, and it is judged whether the several n sample data beforehand set up for coding is stored in the sample number decision circuit 212 concerned. When it judges with the sample number stored in the above-mentioned input sample buffer 211 being less than required sample number n in this sample number decision circuit 212, The recognition signal which shows that is sent to the absolute value calculation circuit 201, and processing which this mentioned above about a new input sample is performed. In the sample number decision circuit 212, when it judges with the sample number required for the input sample buffer 211 having been stored, the recognition signal which shows that from the sample number decision circuit 212 concerned to the signal coding circuit 213 is sent.
[0040]The sample data of the above-mentioned sample number n supplied from the above-mentioned input sample buffer 211 in the signal coding circuit 213 concerned when the recognition signal concerned was supplied is coded, After sending the coded sample data concerned to the signal output circuit 215 and completing these processings, the recognition signal which shows that is sent to the sample buffer zero-clear circuit 214.
[0041]In the above-mentioned sample buffer zero-clear circuit 214, supply of the recognition signal which shows the end of the above-mentioned processing from the above-mentioned signal coding circuit 213 will carry out the zero clear of the above-mentioned input sample buffer 211.
[0042]Although the signal coding part 210 comprises the above-mentioned input sample buffer 211, the sample number decision circuit 212, the signal coding circuit 213, and the sample buffer zero-clear circuit 214, When not coding sample data, as for these components, there is no necessity and the output of the maximal value decision circuit 208 will be sent to the direct signal output circuit 215.
[0043]In the above-mentioned signal output circuit 215, the supplied sample data (when not coding, it is the sample data concerned itself which is not coded) which was coded is outputted to external terminal 216 grade, and processing is ended.
[0044]Next, drawing 3 is a flow chart which shows the operation at the time of reproducing a signal in the signal processor of this invention. From Step S21 of this drawing 3 to the step S39 shows down stream processing of reproduction motion.
[0045]In this drawing 3, as initialization, the maximum and the index of the maximal value are set to 0, and it progresses to the following step S22 at Step S21.
[0046]In the step S22 concerned, said coded maximal value corresponding to the present each sample data, i.e., partial signal, of an index which have been reproduced or transmitted, for example from the recording medium is inputted, and it progresses to the following step S23. In this step S23, the maximal value coded [above-mentioned] is decrypted and it progresses to the following step S24. About the method of coding here and decryption, limitation in particular is not performed like the time of operation of the record mentioned above or transmission. When it is data in which the inputted maximal value is not coded, the above-mentioned step S23 is skipped.
[0047]In Step S24, the maximal value (when coding is not performed, it is the maximal value concerned itself which is not coded) decrypted [above-mentioned], As compared with the maximum of the maximal value till then, when the decrypted maximal value concerned is larger than the above-mentioned maximum (yes), it progresses to the following step S25, and when the maximum is conversely larger (no), it progresses to Step S26.
[0048]In the above-mentioned step S25, the above-mentioned maximum is transposed to the decrypted maximal value concerned, and it progresses to the following step S26. In the step S26 concerned, when judging whether the above-mentioned processing was completed about all the indexes, and not having ended (no), after moving to the following index at Step S27, it returns to Step S22. On the contrary, in Step S26, when it

is judged that the above-mentioned processing is completed about all the indexes (yes), it progresses to the following step S28.
[0049]In the signal processor of this example, the maximum of the maximal value about all the partial signals of the regenerative signal (real signal) with which reproduction is made in Step S28 from the above step S21 is calculated.
[0050]Next, in Step S28, the index for reproduction is anew set to 0, and it progresses to the following step S29. In this step S29, it progresses to Step S30, after inputting the maximal value by which the partial signal corresponding to the present index was coded [above-mentioned]. The coded maximal value concerned is decrypted in this step S30. When the maximal value is coded as mentioned above and it is not recorded or transmitted, this step S30 is skipped.
[0051]In the following step S31, when processing is completed at said step S26, the value p broken by the maximal value asked for the maximum already calculated at Step S29 is calculated, and it progresses to Step S32 after that.
[0052]In Step S32, the sample data which was coded, and was recorded or transmitted [above-mentioned] is inputted, and it progresses to Step S33. In this step S33, when it judges whether the input concerned was performed by n sample required for decryption and judges with having returned and ended to Step S32 when [concerned] it judged with the input for n sample yet not being completed (no) (yes), it progresses to the following step S34.
[0053]At this step S34, the n above-mentioned sample data are decrypted and it progresses to the following step S35. Since Step S32 to the step S34 is the process that it is needed when a signal is coded and it is recorded or transmitted, when record or transmission is performed in the form where it is inputted without coding a signal, it is skipped.
[0054]In the following step S35, it progresses to Step S36, after multiplying each sample data decoded in Step S34 by p. In this step S36, n sample data which multiplied by p in the above-mentioned step S35 are outputted, and it progresses to Step S37.
[0055]In this step S37, when it judges whether the value of the index corresponding to the following sample is changing and judges with not changing (no), it returns to Step S32, and when decryption of a signal is continued and it judges that it was changing further (yes), it progresses to Step S38.
[0056]In the step S38 concerned, when it judges with judging whether the above-mentioned processing about the partial signal corresponding to all the indexes was completed, and not having ended (no), after progressing to the following step S39 and making the value of an index increase one time at the step S39 concerned, it returns to Step S29. On the other hand, when it judges with processing having been completed at Step S38 (yes), processing of signal regeneration is ended.
[0057]Next, the composition which performs the above-mentioned reproduction of the signal processor which used the signal processing method of this invention is shown in drawing 4.
[0058]In this drawing 4, in the maximal value decoding circuit 242 of the maximum set part 241. The maximal value which was detected by the signal processor of said this invention example, and was coded on the occasion of record or transmission is inputted via terminal 240 grade, decryption of the coded maximal value concerned about the partial signal corresponding to all the indexes is made here, and it is sent to the posterior pole large value buffer 243. When the maximal value concerned is not coded as mentioned above on the occasion of record of the maximal value, or transmission, the maximal value decoding circuit 242 concerned will be omitted, and the maximal value which was not coded will be directly sent to the maximal value buffer 243.
[0059]In the next maximum detector circuit 244, the maximum of all the maximal value stored in the above-mentioned maximal value buffer 243 is detected, and the maximum concerned is sent to the multiplier determining circuit 247. It may be made to replace with this in quest of the logical sum of all the maximal value as an approximate value of the maximum concerned instead of calculating the above-mentioned maximum directly, when there are restrictions of a hardware scale etc. here.
[0060]With next, the applicable maximal value in the maximal value buffer 243 corresponding to the index inputted via the terminal 245 grade in the above-mentioned multiplier determining circuit 247. By **(ing) the supply ****** maximum from the above-mentioned maximum detector circuit 244, the multiplier to each sample data of the partial signal corresponding to the index concerned is computed. The number of the exponentiations of 2 is adopted as an approximate value of the multiplier concerned here, and it may be made to realize the multiplication to each sample data by carrying out the bit shift of each sample data concerned.

[0061]The reproduced signal (sample data) is supplied to the terminal 246, and this is savings ** to the input sample buffer 249 of the signal decoding section 248. In the next sample number decision circuit 250, it is judged whether the sample number required for decryption was stored to the above-mentioned input sample buffer 249. When it judges with the sample number required for the above-mentioned decryption having been stored in the above-mentioned input sample buffer 249 in the sample number decision circuit 250 concerned, the sample data currently stored in the above-mentioned input sample buffer 249 is sent to the next signal decoding circuit 251, and is decoded here. The time series sample data which might get twisted in decryption of this signal decoding circuit 251 is sent to the time series sample multiplication circuit 252.
[0062]When coding of the signal is not performed as mentioned above, The signal decoding section 248 which consists of the above-mentioned input sample buffer 249, the sample number decision circuit 250, and the signal decoding circuit 251 will be omitted, and the reproduction input signal from the terminal 246 will be sent to the direct time series sample multiplication circuit 252. Although the case where fixed numbers block this example a sample every, and it codes also about coding and decoding method of a signal is mentioned as the example, the method of coding using non-blocking operations, such as a filter, may be adopted, and limitation in particular is not performed. Input terminals into which the above-mentioned maximal value, an index, and an input signal are inputted may be made to perform this with one or more terminals.
[0063]In the time series sample multiplication circuit 252, the multiplication of the multiplier from the above-mentioned multiplier determining circuit 247 and the time series sample data from the signal decoding circuit 251 is performed, and the time series sample data (time series sample data to which the multiplication of the above-mentioned multiplier was carried out) of the result is outputted to the signal output circuit 253. When the exponentiation of 2 is adopted as a multiplier as mentioned above, a bit shift can perform the multiplication in the above-mentioned time series sample multiplication circuit 252.
[0064]In the above-mentioned signal output circuit 253, the time series sample data to which the above-mentioned multiplication was performed is outputted to terminal 254 grade, and processing is ended.
[0065]Next, in drawing 3 and drawing 4 which were mentioned above, although the gain of the regenerative signal is controlled in digital one, this invention is included, also when performing processing same in analog.
[0066]The flow chart explaining the operation in the case of controlling the level of a regenerative signal in analog with the signal processing method of this invention is shown in drawing 5. Operation from Step S51 of this drawing 5 to Step S65 shows each process of operation of controlling a signal level in analog. Step S61 ** detects the greatest thing in the maximal value about each partial signal from Step S51 similarly with Step S21 to the step S31 of said drawing 3, and since it is what calculates the value which **(ed) this maximum with the maximal value of each partial signal, the explanation is omitted here.
[0067]In this drawing 5, a level is controlled in analog at Step S62 according to the value obtained at the same step S61 as Step S31 of said drawing 3. In this case, in order to have the effect same with multiplying by p in digital one, processing which adjusts a reproductive level in the composition of the analog circuitry after digital one / analog (D/A) conversion is performed.
[0068]In order to realize Step S62 concretely as composition here, while controlling the attenuation of a signal by the variable resistor, for example in amplifier, can consider the composition of moving the point of contact of a variable resistor automatically according to the value of the above-mentioned p, but. Here, limitation in particular is not performed.
[0069]In the following step S63, when it judges whether the index of the partial signal reproduced now is changing and judges with changing (yes), it progresses to the following step S64. On the contrary, the same operation is repeated until it returns to the same step S63 and then an index changes, when it judges with not changing in the step S63 concerned (no).
[0070]In Step S64, when it judges with judging whether the processing about the partial signal of all the indexes was completed, and not having ended (no), it progresses to Step S65. In this step S65, it moves to the following index and the processing from the above-mentioned step S59 is repeated. On the other hand, when it judges with processing being completed about the partial signal of all the indexes at Step S64 (yes), processing of the analog level control of this drawing 5 is ended.
[0071]In the signal processing method and device of this invention since it seems that it mentioned above, It becomes possible to change a regeneration level effectively, losing the switching action of the regeneration level for every [by the user at the time of reproduction] partial signal, and easing a user's burden, when reproducing the real signal which consists of two or more partial signals recorded or transmitted.
[0072]Next, compression encoding of the digital audio signals is carried out as one example in which the signal

processor which realizes the signal processing method of this invention mentioned above is applied, it records on a recording medium, and the outline composition of the compressed data recording and reproducing device which carries out extension decryption of the signal reproduced from the recording medium is shown in drawing 6.

[0073]In this drawing 6, control of setting out of the maximal value, the gain control of a regenerative signal, etc. in the signal processing method of this example mentioned above is performed by the central processing unit (CPU) 90, As for said maximal value decoding circuit 241, the decoding processing in the signal decoding section 248, etc., coding processing in said maximal value coding circuit 204 or the signal coding part 210 is further performed by the decoder 73 in the encoder 63. About coding and decryption of the maximal value, it can carry out not in the encoder 63 and the decoder 73 but in the above-mentioned CPU90. As for analog gain control (gain adjustment), said digital gain control (gain adjustment) corresponding to said time series sample multiplication circuit 252 is performed in the level-control circuit 77 in the multiplication circuit 78.

[0074]In the compressed data recording and reproducing device 9 shown in this drawing 6, the magneto-optical disc 1 rotated with the spindle motor 51 is first used as a recording medium. What is called a mini disc (MD) etc. that are named generically as a magneto-optical disc for example, 64 mm in diameter can be used for this magneto-optical disc 1. At the time of record of the data to this magneto-optical disc 1. For example, by impressing the modulation magnetic field according to record data by the magnetic head 54 in the state where it irradiated with the laser beam by the optical head 53, what is called magnetic-field-modulation record is performed, and data is recorded along the recording track of the magneto-optical disc 1. At the time of reproduction, the recording track of above-mentioned optical magnetism DISUSUKU 1 is traced by a laser beam by the optical head 53, and it reproduces in magneto-optics.

[0075]The optical head 53 comprises a photodetector etc. which have a light sensing portion of optics, such as laser light sources, such as a laser diode, a collimating lens, an object lens, a polarization beam splitter, and a cylindrical lens, and a prescribed pattern, for example. This optical head 53 is formed in the above-mentioned magnetic head 54 and the position which counters via the magneto-optical disc 1. When recording data on the magneto-optical disc 1, Drive the magnetic head 54 by the head drive circuit 66 of the recording system mentioned later, and the modulation magnetic field according to record data is impressed, and a magnetic-field-modulation method performs thermomagnetism record by irradiating the object track of the magneto-optical disc 1 with a laser beam by the optical head 53. This optical head 53 detects the catoptric light of the laser beam with which the object track was irradiated, detects a focal error with what is called astigmatic method, for example, detects a tracking error by what is called a push pull method. When playing data from the magneto-optical disc 1, the optical head 53 detects the difference in the angle of polarization (car angle of rotation) of the catoptric light from the object track of a laser beam, and generates a regenerative signal at the same time it detects the above-mentioned focal error and a tracking error.

[0076]The output of the optical head 53 is supplied to RF circuit 55. This RF circuit 55 is supplied to the decoder 71 of the reversion system which binary-izes a regenerative signal and mentions it later while it extracts the above-mentioned focus error signal and a tracking error signal from the output of the optical head 53 and supplies them to the servo control circuit 56.

[0077]The servo control circuit 56 comprises a focus servo control circuit, a tracking servo control circuit, a spindle motor servo control circuit, a thread servo control circuit, etc., for example. The above-mentioned focus servo control circuit performs focus control of the optical system of the optical head 53 so that the above-mentioned focus error signal may become zero. The above-mentioned tracking servo control circuit performs tracking control of the optical system of the optical head 53 so that the above-mentioned tracking error signal may become zero. Furthermore, the above-mentioned spindle motor servo control circuit controls the spindle motor 51 to rotate the magneto-optical disc 1 with predetermined revolving speed (for example, constant linear velocity). The above-mentioned thread servo control circuit moves the optical head 53 and the magnetic head 54 to the object track position of the magneto-optical disc 1 specified by the system controller 57. The servo control circuit 56 which performs such various control actions sends the information which shows the operating state of each part controlled by this servo control circuit 56 to the system controller 57.

[0078]The key-input-operations part 58 and the indicator 59 are connected to the system controller 57. This system controller 57 performs control of a recording system and a reversion system by the operational mode specified using the operational input information by the key-input-operations part 58. Based on the address information of the sector unit which is played with a header time, Q data of a sub-code, etc. from the recording track of the magneto-optical disc 1 as for the system controller 7, The recording position and

playback position on the above-mentioned recording track which the optical head 53 and the magnetic head 54 are tracing are managed. Furthermore, the system controller 57 performs control to which regeneration time is displayed on the indicator 59 based on a data compression rate and the reproduction position information on the above-mentioned recording track. The system controller 57 concerned can perform processing by said CPU90, and does not need to provide said CPU90 in this case.

[0079]As opposed to the address information (absolute time information) of the sector unit by which the above-mentioned reproducing time display is played from the recording track of the magneto-optical disc 1 with what is called a header time, what is called sub-code Q data, etc., By carrying out the multiplication of the reciprocal (for example, the time of 1/4 compression 4) of a data compression rate, a actual hour entry is searched for and this is displayed on the indicator 59. When absolute time information is beforehand recorded, for example on recording tracks, such as a magneto-optical disc, at the time of record (preformatted), By reading this preformatted absolute time information and carrying out the multiplication of the reciprocal of a data compression rate, it is also possible to display a current position by the actual record time.

[0080]Next, in the recording system of the record reproduction machine of this disk recording playback equipment, the analog audio input signal AIN from the input terminal 60 is supplied to A/D converter 62 via the low pass filter 61. This A/D converter 62 quantizes the above-mentioned analog audio input signal AIN. The digital audio signals acquired from A/D converter 62 are supplied to the ATC(Adaptive Transform Coding) PCM encoder 63. The digital audio signals of above-mentioned A/D converter 62 are sent also to said CPU90. CPU90 at this time generates said index from the digital audio signals concerned, and sends it to the above-mentioned ATC encoder 63.

[0081]On the other hand, digital audio input signal DIN which contains an index in the input terminal 67 at least, for example from other main story rec/play student devices is supplied, and this input signal DIN is supplied to the ATC encoder 63 and the above-mentioned CPU90 via the digital input interface circuit 68. The CPU90 concerned at this time sends the data obtained by processing setting out etc. of the maximal value corresponding to the signal processing method at the time of record of this invention mentioned above using the above-mentioned index and digital audio signals to the above-mentioned ATC encoder 63.

[0082]As opposed to the time series sample data to which the encoder 63 was supplied via digital audio PCM data and the digital input interface circuitry 68 of a predetermined transfer rate which quantized the above-mentioned input signal AIN with above-mentioned A/D converter 62, Bit compression (data compression) processing is performed, and coding of said maximal value is also performed and these are sent to the memory 64. In the data compression in the above-mentioned encoder 63, although the compression ratio concerned is explained as 4 times, this example has this magnification with the composition for which it does not depend, and can be arbitrarily chosen by an application.

[0083]Next, writing and read-out of data are controlled by the system controller 57, and memorize temporarily the ATC data supplied from the ATC encoder 63, and the memory 64 is used as a buffer memory for recording on a disk if needed. That is, the compressed audio data in which high efficiency coding was made are reduced, for example by the ATC encoder 63 1/4 of the data transfer rate (75 sectors / second) of a CD-DA format with the standard data transfer rate, i.e., 18.75 sectors / second.

This compressed data is continuously written in the memory 14.

If one sector is recorded per four sectors when being compressed 4 times, as mentioned above, it is sufficient for this compressed data (ATC data), but since record of such every four sectors is next to impossible as a matter of fact, it is made to record sector continuation which is mentioned later. This record is burstily performed via a dormant period with the same data transfer rate (75 sectors / second) as a standard CD-DA format by making into a record unit the cluster which comprises predetermined two or more sectors (for example, 32 sector + number sector). That is, in the memory 14 concerned, the ATC audio information continuously written in with the low transfer rate of the 18.75 (= 75/4) sectors / second according to the above-mentioned bit compression rate is burstily read with the transfer rate of the above-mentioned 75 sectors / second as record data. within a time [of the recording operation burstily performed although the overall data transfer rate containing a record dormant period is a low speed of the above-mentioned 18.75 sectors / second about this data read and recorded], and an instant data transfer rate -- the above -- they are standard 75 sectors / second. Therefore, when it is the same speed (constant linear velocity) as the CD-DA format with standard disk rotational speed, record of the same storage density as a year worth CD-DA format and a memory pattern will be performed.

[0084]the record data of ATC audio information etc. burstily read from the above-mentioned memory 64 with

the transfer rate (an instant ---like) of the above-mentioned 75 sectors / second is supplied to the encoder 65. Here, the unit by which continuous recording is carried out by one record in the data row supplied to the encoder 65 from the above-mentioned memory 64 is used as the number sector for cluster connection allotted to the front and back position of the cluster which comprises two or more sectors (for example, 32 sectors), and this cluster. This sector for cluster connection is set up for a long time than the interleave length in the encoder 65.
Even if it interleaves, he is trying not to affect the data of other clusters.

[0085]The encoder 65 performs coding processing (parity addition and interleave processing), EFM coding processing, etc. for an error correction about the record data burstily supplied as mentioned above from the memory 64. The record data in which coding processing by this encoder 65 was performed is supplied to the magnetic head driving circuit 66. The magnetic head 54 is connected to this magnetic head driving circuit 66. The magnetic head 54 is driven so that the modulation magnetic field according to the above-mentioned record data may be impressed to the magneto-optical disc 1.

[0086]The system controller 57 controls a recording position to record continuously the above-mentioned record data burstily read from the memory 64 by this memory control on the recording track of the magneto-optical disc 1 while performing memory control like **** to the memory 64. The recording position of the above-mentioned record data burstily read from the memory 64 by the system controller 57 is managed, and control of this recording position is performed by supplying the control signal which specifies the recording position on the recording track of the magneto-optical disc 1 to the servo control circuit 56.
[0087]Next, the reversion system of this magneto-optical disc record reproduction unit is explained. This reversion system is for playing the record data continuously recorded by the above-mentioned recording system on the recording track of the magneto-optical disc 1.
the reproducing output obtained by tracing the recording track of the magneto-optical disc 1 by a laser beam by the optical head 53 -- RF circuit 55 -- a binary -- it has the decoder 71-izing [the decoder] and supplied.
At this time, not only a magneto-optical disc but read-out of the same optical disc only for playback what is called as compact Dix (CD:Compact Disc) can be performed.
[0088]The decoder 71 is a thing corresponding to the encoder 65 in an above-mentioned recording system, About the reproducing output binary-ized by RF circuit 55, decoding processing, EFM decoding processing, etc. like **** for an error correction are processed, and audio information etc. are reproduced with the transfer rate of 75 sectors / second earlier than a regular transfer rate. The regenerative data obtained by this decoder 71 is supplied to the memory 72.
[0089]Writing and read-out of data are controlled by the system controller 57, and the memory 72 is written in burstily [regenerative data / which is supplied with the transfer rate of 75 sectors / second from the decoder 71 / transfer rate / of 75 sectors / second of those]. This memory 72 is continuously read in the transfer rate 18.75 sector / second of 75 sectors / second when the above-mentioned regenerative data burstily written in with the transfer rate of the above-mentioned 75 sectors / second is regular.
[0090]The system controller 57 performs memory control which reads the above-mentioned regenerative data from the memory 72 continuously with the transfer rate of the above-mentioned 18.75 sectors / second while writing regenerative data in the memory 72 with the transfer rate of 75 sectors / second. The system controller 57 controls a playback position to play continuously the above-mentioned regenerative data burstily written in by this memory control from the memory 72 from the recording track of the magneto-optical disc 1 while performing memory control like **** to the memory 72. Control of this playback position manages the playback position of the above-mentioned regenerative data burstily read from the memory 72 by the system controller 57, It is carried out by supplying the control signal which specifies the playback position on the recording track of the magneto-optical disc 1 or the optical disc 1 to the servo control circuit 56.
[0091]The ATC audio information obtained as regenerative data continuously read from the above-mentioned memory 72 with the transfer rate of 18.75 sectors / second is supplied to the ATC decoder 73. This ATC decoder 73 reproduces 16-bit digital audio information by increasing the data extension (bit extension) of the ATC data of an audio 4 times, and it also performs decryption of said coded maximal value. The digital audio information from this ATC decoder 73 is sent to D/A converter 74 via the multiplication circuit 78, and it is sent also to said CPU90 and the data of the above-mentioned maximal value and an index is also further sent

to this CPU90.
[0092]CPU90 at this time sends the data obtained by processing the multiplier determination corresponding to the signal processing method at the time of reproduction of this invention mentioned above using the above-mentioned index, the maximal value, and digital audio information, etc. to the multiplication circuit 78 or the level-control circuit 77. That is, in performing gain control to a regenerative signal in digital one and performing a multiplier in the above-mentioned multiplication circuit 78 in [again] analog, it sends the control signal of a variable resistor to the level-control circuit 77.
[0093]Here, when performing gain control in digital one, the multiplication of the multiplier from the above-mentioned CPU90 is carried out in the above-mentioned multiplication circuit 78, and this digital data in which gain control was performed in digital one is sent to D/A converter 74. This D/A converter 74 changes into an analog signal the digital audio information supplied from the ATC decoder 73. The output of this D/A converter 74 passes through the level-control circuit 77 as it is via the low pass filter 75, and is outputted from the output terminal 76 as analog audio signal AOUT to which gain control was performed in digital one. In the composition which performs only this digital gain control, the level-control circuit 77 becomes unnecessary. The output of the above-mentioned multiplication circuit 78 can also be outputted from the terminal 80 as the digital audio output signal DOUT via the digitized output interface circuitry 79.
[0094]In performing gain control in analog, The above-mentioned multiplication circuit 78. [whether the digital audio information from the above-mentioned ATC decoder 73 is directly sent to D/A converter 74, without being provided, and] Or if the multiplication circuit 78 is formed, after the multiplication of 1 will be carried out as a multiplier to the digital audio information from the above-mentioned ATC decoder 73, it is sent to D/A converter 74. The analog signal from this D/A converter 74, After being sent to the level-control circuit 77 via the low pass filter 75 and performing gain control based on the control signal from said CPU90 in the level-control circuit 77 concerned, it is outputted from the output terminal 76 as analog audio signal AOUT.
[0095]
[Effect of the Invention]As mentioned above, when performing the record or transmission of a real signal which consists of two or more partial signals according to the signal processing method and device of this invention, Detect the maximal value of the signal level about each partial portion, record or transmit this maximal value with the real signal, and at the time of reproduction The maximum of that maximal value, Compare the maximal value of the partial signal to reproduce, and when the maximal value of the partial signal to reproduce is smaller, The change of a regeneration level is attained effectively, the user not performing the switching action of the regeneration level for every partial signal, therefore easing a user's burden, since he is trying to reproduce the level of the partial signal together with the level of the partial signal of the maximum automatically. Thereby, according to the signal processing method and device of this invention, it becomes possible to a user to provide a more comfortable operating environment.
[0096]Since the maximal value of the signal level about each partial signal is recorded with the real signal according to the signal recording medium of this invention, That maximal value can be used for the level control at the time of reproduction, therefore a user's switching action of the regeneration level for every partial signal is unnecessary at the time of reproduction of this signal recording medium, and it becomes possible to change a regeneration level effectively, easing a user's burden.

[Translation done.]

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TECHNICAL FIELD

[Industrial Application]This invention relates digital signals, such as music and a sound, to record, the signal processing method at the time of transmitting or playing, its device, and the signal recording medium with which the signal processed with this signal processing method is recorded, for example.

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PRIOR ART

[Description of the Prior Art]When recording signals, such as music and a sound, from before, for example to archive media, such as what is called a compact disk (CD) (sound recording), the levels of the sound recording usually differ separately. That is, in the compact disk of two or more sheets, the levels of the signal recorded for every disk will differ.
[0003]For this reason, the music etc. of two or more music played, for example from the compact disk (CD) of two or more sheets, etc., For example, since the levels of the signal played from each compact disk as mentioned above differed when it recorded on the disk of one sheet etc. in which record reproduction is possible, When playing the disk of one sheet which recorded two or more music concerned, a user needs to change a regeneration level for every music, or it is necessary to control.

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EFFECT OF THE INVENTION

[Effect of the Invention]As mentioned above, when performing the record or transmission of a real signal which consists of two or more partial signals according to the signal processing method and device of this invention, Detect the maximal value of the signal level about each partial portion, record or transmit this maximal value with the real signal, and at the time of reproduction The maximum of that maximal value, Compare the maximal value of the partial signal to reproduce, and when the maximal value of the partial signal to reproduce is smaller, The change of a regeneration level is attained effectively, the user not performing the switching action of the regeneration level for every partial signal, therefore easing a user's burden, since he is trying to reproduce the level of the partial signal together with the level of the partial signal of the maximum automatically. Thereby, according to the signal processing method and device of this invention, it becomes possible to a user to provide a more comfortable operating environment.
[0096]Since the maximal value of the signal level about each partial signal is recorded with the real signal according to the signal recording medium of this invention, That maximal value can be used for the level control at the time of reproduction, therefore a user's switching action of the regeneration level for every partial signal is unnecessary at the time of reproduction of this signal recording medium, and it becomes possible to change a regeneration level effectively, easing a user's burden.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]Namely, the music and the sound which were recorded on the inside of one recording medium when become common and stated, Or when the music and the sound which were transmitted from one transmission medium are divided into some portions and the levels recorded or transmitted for every portion differ (for example, when divided for every music), it is necessary to change a regeneration level for every portion in the case of the playback.
[0005]Therefore, the switching action of a level must be frequently performed at the time of reproduction, operation becomes very complicated, and the burden of the user concerned is increasing the user.
[0006]Then, even when reproducing the signal which this invention was made in view of such the actual condition, and was divided into two or more portions, and was recorded or transmitted. a user does not need to perform the switching action of a regeneration level frequently, but it aims at providing the signal processing method which enables the change of a regeneration level effectively, a device, and a signal recording medium.

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MEANS

[Means for Solving the Problem]This invention is proposed in order to attain the above-mentioned purpose, and a signal processing method of this invention, It is a signal processing method of a real signal which consists of two or more partial signals, the maximal value of a signal level about each partial signal is detected, and the above-mentioned maximal value is recorded or transmitted with the above-mentioned real signal. Here, it should code and logical sum of an absolute value of the above-mentioned partial signal can be used for a real signal and the maximal value which are recorded or transmitted as an approximate value of the above-mentioned maximal value.
[0008]Next, a signal recording medium of this invention records a signal processed by a signal processing method of above-mentioned this invention.
[0009]In a signal processing method which reproduces a signal which was processed using a signal processing method of this invention, and was recorded or transmitted. According to a signal processing method at the time of the above-mentioned record or transmission, reproduction of a real signal by which record or transmission was made is preceded, The maximum in inside of the maximal value with which record or transmission of a signal level about each partial signal was made is detected, and it performs multiplying by a value which **(ed) the detected maximum concerned with the maximal value of each partial signal for every partial signal at the time of reproduction of a real signal. When the maximal value with which record or transmission was made is coded, The maximal value coded [above-mentioned] is decrypted in advance of reproduction of a real signal, the maximum in inside of each decrypted maximal value concerned is detected, and it performs multiplying by a value which **(ed) the maximum with the maximal value of each partial signal for every partial signal at the time of reproduction of a real signal. In advance of reproduction of a coded real signal, the maximum in inside of the maximal value with which record or transmission of a signal level about each partial signal was made is detected, and it multiplies by a value which **(ed) the detected maximum concerned with the maximal value of each partial signal for each [which was decrypted at the time of reproduction of a real signal] partial signal of every. When both a real signal and the maximal value are coded, In advance of reproduction of a coded real signal, the coded maximal value with which record or transmission of a signal level about a partial signal was made is decrypted, The maximum in inside of each decrypted maximal value concerned is detected, and it performs multiplying by a value which **(ed) the detected maximum concerned with the maximal value of each partial signal for each [which was decrypted at the time of reproduction of a real signal] partial signal of every.
[0010]In a signal processing method of this invention, a bit shift can be used as the multiplication concerned, using a value of a exponentiation of 2 as an approximate value of a multiplier by which each above-mentioned partial signal is multiplied.
[0011]Next, a signal processor of this invention has a detection means to be a signal processor of a real signal which consists of two or more partial signals, and to detect the maximal value of a signal level about each partial signal of a real signal, and records or transmits the above-mentioned maximal value with the above-mentioned real signal. A real signal and the maximal value which are recorded or transmitted also with a signal processor of this invention should be coded. Logical sum of an absolute value of each above-mentioned partial signal can be used as an approximate value of the above-mentioned maximal value.
[0012]A signal processor which reproduces a signal which was processed using a signal processing method of this invention, and was recorded or transmitted is provided with the following.
A detection means to detect the maximum in inside of the maximal value with which record or transmission of a signal level about each partial signal was made in advance of reproduction of a real signal by which record or

transmission was made.
A multiplication means which multiplies by a value which **(ed) the detected maximum concerned with the maximal value of each partial signal for every partial signal at the time of reproduction of a real signal.
A detection means detects the maximum in inside of each of that maximal value, after decrypting the maximal value by which a signal level about each partial signal was coded, when the maximal value recorded or transmitted is coded by **. When a real signal recorded or transmitted is coded, it multiplies by a multiplication means for each [which decrypted a value which **(ed) the maximum detected by a detection means with the maximal value of each partial signal at the time of reproduction of a real signal] partial signal of every. When both a real signal and the maximal value are coded, The coded maximal value with which record or transmission was made in a detection means is decrypted, the maximum in inside of each decrypted maximal value concerned is detected, and it multiplies by a value which **(ed) the detected maximum concerned with the maximal value of each partial signal in a multiplication means for each [which was decrypted at the time of reproduction of a real signal] partial signal of every.
[0013]Also in a signal processor of this invention, a bit shift can be used as the multiplication concerned, using a value of a exponentiation of 2 as an approximate value of a multiplier by which each above-mentioned partial signal is multiplied.
[0014]A signal processor of this invention which reproduces a signal which was processed using a signal processing method of this invention, and was recorded or transmitted, Reproduction of a real signal which can also control a regeneration level in analog for example, by which record or transmission was made is preceded, It has a control means to which the maximal value with which record or transmission of a signal level about each partial signal was made is supplied, and the control means concerned detects the maximum in inside of the above-mentioned maximal value, and controls a regeneration level in analog for every partial signal according to the maximal value and the maximum of each partial signal at the time of reproduction of a real signal. To this signal processor that controls a regeneration level in analog. A detection means to detect the maximal value with which record or transmission of a signal level about each partial signal was made, and the maximum in inside of each maximal value concerned is formed, According to the maximal value and the maximum of each partial signal which were detected by the above-mentioned detection means, a regeneration level is also controllable by a control means in analog for every partial signal at the time of reproduction of a real signal.
[0015]When the maximal value with which record or transmission is made is coded in a signal processor of this invention which controls a regeneration level in analog, This coded maximal value is supplied to a control means, the control means concerned decrypts the above-mentioned maximal value, the maximum in inside of each decrypted maximal value concerned is detected, and what controls a regeneration level in analog for every partial signal at the time of reproduction of a real signal is considered according to the maximal value and the maximum of each partial signal. The coded maximal value is also being able to decrypt by a decoding means and detecting the maximum in inside of each maximal value concerned from an output of the decoding means concerned by a detection means further, before ******(ing) to a control means today, A control means controls a regeneration level in analog for every partial signal according to this maximal value and maximum that were detected at the time of reproduction of a real signal.

[Translation done.]

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OPERATION

[Function]When performing the record or transmission of a real signal which consists of two or more partial partial signals according to the signal processing method and device of this invention, Detect the maximal value of the signal level about each partial signal, record or transmit this maximal value with the real signal, and at the time of reproduction The maximum of that maximal value, The maximal value of the partial signal to reproduce is compared, and when the maximal value of the partial signal to reproduce is smaller, he is trying to reproduce the level of the portion together with the level of the partial signal of the maximum automatically.
[0017]According to the signal recording medium of this invention, since the maximal value of the signal level about each partial signal is recorded with the real signal, the maximal value can be used for the level control at the time of reproduction.

[Translation done.]

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EXAMPLE

[Example]Hereafter, the desirable example of this invention is described, referring to drawings.
[0019]Drawing 1 is a flow chart which shows the explanation of operation at the time of performing the record or transmission of a signal in the signal processor with which the signal processing method of this invention is applied. From Step S2 of this drawing 1 to step S9 expresses down stream processing of operation of an important section.
[0020]In this drawing 1, the time series sample data of a sound or music is inputted as a real signal at the first step S1. The terminal input from the thing read in the recording medium or another device, etc. may be used for the input of a signal here, and the method in particular of the input concerned cannot be limited, but can apply various methods.
[0021]The index with which the sample data of the time series inputted [above-mentioned] expresses with the following step S2 whether it is what is contained in the portion of what position of the whole judges whether it changed with the time of a front sample. This index can be considered to be the same thing as the index of Q data format of said compact disk, therefore can mention digital signals, such as musical music, as an example as the above-mentioned portion. Limitation in particular of in what kind of form the index concerned is inputted like the case of the above-mentioned time series sample data is not performed. In this step S2, when it judges with not changing to the following step S3 again when it judges with the above-mentioned index changing (yes) (no), it progresses to Step S6.
[0022]In Step S3, when it judges whether the present index is "1" and judges with it being "1" (yes), it progresses to Step S6, and when it judges with it not being "1" (no), it progresses to step S4.
[0023]In step S4, the maximal value of each sample data corresponding to the index in front of the present one, i.e., a partial signal, is outputted, and it progresses to the following step S5. In the step S5 concerned, the zero clear of the maximal value memorized previously is carried out, and it progresses to Step S6.
[0024]In the following step S6, the maximal value is larger, or as compared with the absolute value of input sample data, in being equal (yes), he follows the maximal value memorized to Step S8, and when the maximal value is conversely smaller (no), it progresses to Step S7.
[0025]In Step S7, the absolute value of the above-mentioned input sample data is substituted for the maximal value, and it progresses to Step S8. Although it is not smaller than the absolute value of input sample data, it may be made to substitute the approximate value which is a near value instead of substituting the absolute value of input sample data for the maximal value here.
[0026]In the following step S8, input sample data are copied to an input sample buffer, and it progresses to the following step S9.
[0027]It is judged whether it is equal to sample number n beforehand set up in this step S9 for coding of the sample number stored in the above-mentioned input sample buffer, When it judges with it not being equal to the following step S10 when it judges with it being equal (yes) (no), it returns to Step S1.
[0028]In Step S10, it codes using each sample data of the above-mentioned sample number n stored in the above-mentioned input sample buffer, and progresses to the following step S11. It is also possible to use compression encoding which may be carried out to the above-mentioned n changing by the method of coding, and coding it at a time one sample as n= 1 here, and may be carried out to coding the block which makes n plurality and consists of two or more of these samples, for example, is mentioned later. or [omitting the above-mentioned step S8 and step S9 in this case by the ability also direct-recording or also transmit / not coding Step S10, but / input sample data] -- or what is necessary is just to make it consider n= 1, if it does not omit Although this example has described the example which codes, it is also considered that it is made

not to code, either as mentioned above, and it does not limit especially for whether the method of coding and coding are performed here. In not coding, when outputting a signal in Step S12 mentioned later, the direct output of an input signal, i.e., the real signal, will be carried out.
[0029]In the next step S11 of the above-mentioned step S10, all the data in the used input sample buffer is transposed to 0, and it progresses to the following step S12. The coded signal is outputted in the step S12 concerned.
Then, processing is ended.
Naturally this step S12 will be skipped, when the above-mentioned step S8 and step S9 are omitted.
[0030]Next, the composition of the important section at the time of performing record or transmission in the signal processor of this invention example with which the signal processing method of this invention is applied is shown in drawing 2.
[0031]In this drawing 2, the absolute value calculation circuit 201 computes the absolute value of the time series sample data which is the real signal supplied from the terminal 200, and performs processing which sends this absolute value to the maximal value decision circuit 208 of the maximal value set part 207 with the sample data inputted [above-mentioned].
[0032]The data of the index with which the sample data inputted [above-mentioned] expresses whether it is a signal included in which portion of the whole to the index decision circuit 203, It is supplied via the terminal 202, and if the index concerned has changed with the index in front of one, processing which sends the index to the maximal value coding circuit 204 will be performed in the index decision circuit 203 concerned.
[0033]In the maximal value coding circuit 204 concerned, the maximal value to the above-mentioned index is detected from the input sample data from the above-mentioned terminal 200, the supplied maximal value is coded, this is outputted, and this is sent to the maximal value output circuit 205. Although what has various normalization coefficients etc. which are used when coding the thing which uses the number of bits of the maximal value, for example as numerals, or input sample data as the method of the coding in this maximal value coding circuit 204 can be considered, limitation in particular is not performed here. Since coding of the maximal value concerned is not indispensable conditions in this invention, it is good also as what is not performed. The flow chart of drawing 1 mentioned above shows the example which does not perform the coding concerned.
[0034]In the next maximal value output circuit 205, the maximal value obtained by processing of each sample data corresponding to the index in front of one, i.e., a partial signal, is outputted via the terminal 217, and the recognition signal which shows that the maximal value was outputted is sent to the maximal value zero-clear circuit 206.
[0035]In the maximal value zero-clear circuit 206 concerned, according to the above-mentioned recognition signal, the zero clear of the memory currently used for memory of the maximal value is carried out, and the recognition signal which shows the purport concerned that the zero clear was carried out, to the above-mentioned maximal value decision circuit 208 of the maximal value set part 207 is sent.
[0036]In the above-mentioned maximal value decision circuit 208, the maximal value obtained by processing to each sample data corresponding to the index in front of one and the absolute value output from said absolute value calculation circuit 201 are measured, When the above-mentioned maximal value is larger, the time series sample data itself sent from the above-mentioned absolute value calculation circuit 201 is sent to the input sample buffer 211 of the signal coding part 210. On the contrary, when the absolute value of this sample data is larger, it not only sends the above-mentioned time series sample data to the above-mentioned input sample buffer 211, but it sends the absolute value concerned to the maximal value substitution circuit 209.
[0037]The inputted absolute value concerned is substituted for the maximal value substitution circuit 209 concerned to the memory allocated to the maximal value.
[0038]Although the above-mentioned maximal value decision circuit 207 and the maximal value substitution circuit 209 constitute the maximal value set part 207 which sets up the maximal value, they may be made to take the logical sum of the absolute value output of the above-mentioned absolute value calculation circuit 201 instead of these processings, and to output as an approximate value of the maximal value of this partial signal.
[0039]In the following signal coding part 210, the data of the sample number stored in the above-mentioned input sample buffer 211 is sent to the sample number decision circuit 212, and it is judged whether the several n sample data beforehand set up for coding is stored in the sample number decision circuit 212 concerned. When it judges with the sample number stored in the above-mentioned input sample buffer 211 being less than

required sample number n in this sample number decision circuit 212, The recognition signal which shows that is sent to the absolute value calculation circuit 201, and processing which this mentioned above about a new input sample is performed. In the sample number decision circuit 212, when it judges with the sample number required for the input sample buffer 211 having been stored, the recognition signal which shows that from the sample number decision circuit 212 concerned to the signal coding circuit 213 is sent.
[0040]The sample data of the above-mentioned sample number n supplied from the above-mentioned input sample buffer 211 in the signal coding circuit 213 concerned when the recognition signal concerned was supplied is coded, After sending the coded sample data concerned to the signal output circuit 215 and completing these processings, the recognition signal which shows that is sent to the sample buffer zero-clear circuit 214.
[0041]In the above-mentioned sample buffer zero-clear circuit 214, supply of the recognition signal which shows the end of the above-mentioned processing from the above-mentioned signal coding circuit 213 will carry out the zero clear of the above-mentioned input sample buffer 211.
[0042]Although the signal coding part 210 comprises the above-mentioned input sample buffer 211, the sample number decision circuit 212, the signal coding circuit 213, and the sample buffer zero-clear circuit 214, When not coding sample data, as for these components, there is no necessity and the output of the maximal value decision circuit 208 will be sent to the direct signal output circuit 215.
[0043]In the above-mentioned signal output circuit 215, the supplied sample data (when not coding, it is the sample data concerned itself which is not coded) which was coded is outputted to external terminal 216 grade, and processing is ended.
[0044]Next, drawing 3 is a flow chart which shows the operation at the time of reproducing a signal in the signal processor of this invention. From Step S21 of this drawing 3 to the step S39 shows down stream processing of reproduction motion.
[0045]In this drawing 3, as initialization, the maximum and the index of the maximal value are set to 0, and it progresses to the following step S22 at Step S21.
[0046]In the step S22 concerned, said coded maximal value corresponding to the present each sample data, i.e., partial signal, of an index which have been reproduced or transmitted, for example from the recording medium is inputted, and it progresses to the following step S23. In this step S23, the maximal value coded [above-mentioned] is decrypted and it progresses to the following step S24. About the method of coding here and decryption, limitation in particular is not performed like the time of operation of the record mentioned above or transmission. When it is data in which the inputted maximal value is not coded, the above-mentioned step S23 is skipped.
[0047]In Step S24, the maximal value (when coding is not performed, it is the maximal value concerned itself which is not coded) decrypted [above-mentioned], As compared with the maximum of the maximal value till then, when the decrypted maximal value concerned is larger than the above-mentioned maximum (yes), it progresses to the following step S25, and when the maximum is conversely larger (no), it progresses to Step S26.
[0048]In the above-mentioned step S25, the above-mentioned maximum is transposed to the decrypted maximal value concerned, and it progresses to the following step S26. In the step S26 concerned, when judging whether the above-mentioned processing was completed about all the indexes, and not having ended (no), after moving to the following index at Step S27, it returns to Step S22. On the contrary, in Step S26, when it is judged that the above-mentioned processing is completed about all the indexes (yes), it progresses to the following step S28.
[0049]In the signal processor of this example, the maximum of the maximal value about all the partial signals of the regenerative signal (real signal) with which reproduction is made in Step S28 from the above step S21 is calculated.
[0050]Next, in Step S28, the index for reproduction is anew set to 0, and it progresses to the following step S29. In this step S29, it progresses to Step S30, after inputting the maximal value by which the partial signal corresponding to the present index was coded [above-mentioned]. The coded maximal value concerned is decrypted in this step S30. When the maximal value is coded as mentioned above and it is not recorded or transmitted, this step S30 is skipped.
[0051]In the following step S31, when processing is completed at said step S26, the value p broken by the maximal value asked for the maximum already calculated at Step S29 is calculated, and it progresses to Step S32 after that.

[0052]In Step S32, the sample data which was coded, and was recorded or transmitted [above-mentioned] is inputted, and it progresses to Step S33. In this step S33, when it judges whether the input concerned was performed by n sample required for decryption and judges with having returned and ended to Step S32 when [concerned] it judged with the input for n sample yet not being completed (no) (yes), it progresses to the following step S34.
[0053]At this step S34, the n above-mentioned sample data are decrypted and it progresses to the following step S35. Since Step S32 to the step S34 is the process that it is needed when a signal is coded and it is recorded or transmitted, when record or transmission is performed in the form where it is inputted without coding a signal, it is skipped.
[0054]In the following step S35, it progresses to Step S36, after multiplying each sample data decoded in Step S34 by p. In this step S36, n sample data which multiplied by p in the above-mentioned step S35 are outputted, and it progresses to Step S37.
[0055]In this step S37, when it judges whether the value of the index corresponding to the following sample is changing and judges with not changing (no), it returns to Step S32, and when decryption of a signal is continued and it judges that it was changing further (yes), it progresses to Step S38.
[0056]In the step S38 concerned, when it judges with judging whether the above-mentioned processing about the partial signal corresponding to all the indexes was completed, and not having ended (no), after progressing to the following step S39 and making the value of an index increase one time at the step S39 concerned, it returns to Step S29. On the other hand, when it judges with processing having been completed at Step S38 (yes), processing of signal regeneration is ended.
[0057]Next, the composition which performs the above-mentioned reproduction of the signal processor which used the signal processing method of this invention is shown in drawing 4.
[0058]In this drawing 4, in the maximal value decoding circuit 242 of the maximum set part 241. The maximal value which was detected by the signal processor of said this invention example, and was coded on the occasion of record or transmission is inputted via terminal 240 grade, decryption of the coded maximal value concerned about the partial signal corresponding to all the indexes is made here, and it is sent to the posterior pole large value buffer 243. When the maximal value concerned is not coded as mentioned above on the occasion of record of the maximal value, or transmission, the maximal value decoding circuit 242 concerned will be omitted, and the maximal value which was not coded will be directly sent to the maximal value buffer 243.
[0059]In the next maximum detector circuit 244, the maximum of all the maximal value stored in the above-mentioned maximal value buffer 243 is detected, and the maximum concerned is sent to the multiplier determining circuit 247. It may be made to replace with this in quest of the logical sum of all the maximal value as an approximate value of the maximum concerned instead of calculating the above-mentioned maximum directly, when there are restrictions of a hardware scale etc. here.
[0060]With next, the applicable maximal value in the maximal value buffer 243 corresponding to the index inputted via the terminal 245 grade in the above-mentioned multiplier determining circuit 247. By **(ing) the supply ****** maximum from the above-mentioned maximum detector circuit 244, the multiplier to each sample data of the partial signal corresponding to the index concerned is computed. The number of the exponentiations of 2 is adopted as an approximate value of the multiplier concerned here, and it may be made to realize the multiplication to each sample data by carrying out the bit shift of each sample data concerned.
[0061]The reproduced signal (sample data) is supplied to the terminal 246, and this is savings ** to the input sample buffer 249 of the signal decoding section 248. In the next sample number decision circuit 250, it is judged whether the sample number required for decryption was stored to the above-mentioned input sample buffer 249. When it judges with the sample number required for the above-mentioned decryption having been stored in the above-mentioned input sample buffer 249 in the sample number decision circuit 250 concerned, the sample data currently stored in the above-mentioned input sample buffer 249 is sent to the next signal decoding circuit 251, and is decoded here. The time series sample data which might get twisted in decryption of this signal decoding circuit 251 is sent to the time series sample multiplication circuit 252.
[0062]When coding of the signal is not performed as mentioned above, The signal decoding section 248 which consists of the above-mentioned input sample buffer 249, the sample number decision circuit 250, and the signal decoding circuit 251 will be omitted, and the reproduction input signal from the terminal 246 will be sent to the direct time series sample multiplication circuit 252. Although the case where fixed numbers block this example a sample every, and it codes also about coding and decoding method of a signal is mentioned as the

example, the method of coding using non-blocking operations, such as a filter, may be adopted, and limitation in particular is not performed. Input terminals into which the above-mentioned maximal value, an index, and an input signal are inputted may be made to perform this with one or more terminals.
[0063]In the time series sample multiplication circuit 252, the multiplication of the multiplier from the above-mentioned multiplier determining circuit 247 and the time series sample data from the signal decoding circuit 251 is performed, and the time series sample data (time series sample data to which the multiplication of the above-mentioned multiplier was carried out) of the result is outputted to the signal output circuit 253. When the exponentiation of 2 is adopted as a multiplier as mentioned above, a bit shift can perform the multiplication in the above-mentioned time series sample multiplication circuit 252.
[0064]In the above-mentioned signal output circuit 253, the time series sample data to which the above-mentioned multiplication was performed is outputted to terminal 254 grade, and processing is ended.
[0065]Next, in drawing 3 and drawing 4 which were mentioned above, although the gain of the regenerative signal is controlled in digital one, this invention is included, also when performing processing same in analog.
[0066]The flow chart explaining the operation in the case of controlling the level of a regenerative signal in analog with the signal processing method of this invention is shown in drawing 5. Operation from Step S51 of this drawing 5 to Step S65 shows each process of operation of controlling a signal level in analog. Step S61 ** detects the greatest thing in the maximal value about each partial signal from Step S51 similarly with Step S21 to the step S31 of said drawing 3, and since it is what calculates the value which **(ed) this maximum with the maximal value of each partial signal, the explanation is omitted here.
[0067]In this drawing 5, a level is controlled in analog at Step S62 according to the value obtained at the same step S61 as Step S31 of said drawing 3. In this case, in order to have the effect same with multiplying by p in digital one, processing which adjusts a reproductive level in the composition of the analog circuitry after digital one / analog (D/A) conversion is performed.
[0068]In order to realize Step S62 concretely as composition here, while controlling the attenuation of a signal by the variable resistor, for example in amplifier, can consider the composition of moving the point of contact of a variable resistor automatically according to the value of the above-mentioned p, but. Here, limitation in particular is not performed.
[0069]In the following step S63, when it judges whether the index of the partial signal reproduced now is changing and judges with changing (yes), it progresses to the following step S64. On the contrary, the same operation is repeated until it returns to the same step S63 and then an index changes, when it judges with not changing in the step S63 concerned (no).
[0070]In Step S64, when it judges with judging whether the processing about the partial signal of all the indexes was completed, and not having ended (no), it progresses to Step S65. In this step S65, it moves to the following index and the processing from the above-mentioned step S59 is repeated. On the other hand, when it judges with processing being completed about the partial signal of all the indexes at Step S64 (yes), processing of the analog level control of this drawing 5 is ended.
[0071]In the signal processing method and device of this invention since it seems that it mentioned above, It becomes possible to change a regeneration level effectively, losing the switching action of the regeneration level for every [by the user at the time of reproduction] partial signal, and easing a user's burden, when reproducing the real signal which consists of two or more partial signals recorded or transmitted.
[0072]Next, compression encoding of the digital audio signals is carried out as one example in which the signal processor which realizes the signal processing method of this invention mentioned above is applied, it records on a recording medium, and the outline composition of the compressed data recording and reproducing device which carries out extension decryption of the signal reproduced from the recording medium is shown in drawing 6.
[0073]In this drawing 6, control of setting out of the maximal value, the gain control of a regenerative signal, etc. in the signal processing method of this example mentioned above is performed by the central processing unit (CPU) 90, As for said maximal value decoding circuit 241, the decoding processing in the signal decoding section 248, etc., coding processing in said maximal value coding circuit 204 or the signal coding part 210 is further performed by the decoder 73 in the encoder 63. About coding and decryption of the maximal value, it can carry out not in the encoder 63 and the decoder 73 but in the above-mentioned CPU90. As for analog gain control (gain adjustment), said digital gain control (gain adjustment) corresponding to said time series sample multiplication circuit 252 is performed in the level-control circuit 77 in the multiplication circuit 78.
[0074]In the compressed data recording and reproducing device 9 shown in this drawing 6, the magneto-

optical disc 1 rotated with the spindle motor 51 is first used as a recording medium. What is called a mini disc (MD) etc. that are named generically as a magneto-optical disc for example, 64 mm in diameter can be used for this magneto-optical disc 1. At the time of record of the data to this magneto-optical disc 1. For example, by impressing the modulation magnetic field according to record data by the magnetic head 54 in the state where it irradiated with the laser beam by the optical head 53, what is called magnetic-field-modulation record is performed, and data is recorded along the recording track of the magneto-optical disc 1. At the time of reproduction, the recording track of above-mentioned optical magnetism DISUSUKU 1 is traced by a laser beam by the optical head 53, and it reproduces in magneto-optics.

[0075]The optical head 53 comprises a photodetector etc. which have a light sensing portion of optics, such as laser light sources, such as a laser diode, a collimating lens, an object lens, a polarization beam splitter, and a cylindrical lens, and a prescribed pattern, for example. This optical head 53 is formed in the above-mentioned magnetic head 54 and the position which counters via the magneto-optical disc 1. When recording data on the magneto-optical disc 1, Drive the magnetic head 54 by the head drive circuit 66 of the recording system mentioned later, and the modulation magnetic field according to record data is impressed, and a magnetic-field-modulation method performs thermomagnetism record by irradiating the object track of the magneto-optical disc 1 with a laser beam by the optical head 53. This optical head 53 detects the catoptric light of the laser beam with which the object track was irradiated, detects a focal error with what is called astigmatic method, for example, detects a tracking error by what is called a push pull method. When playing data from the magneto-optical disc 1, the optical head 53 detects the difference in the angle of polarization (car angle of rotation) of the catoptric light from the object track of a laser beam, and generates a regenerative signal at the same time it detects the above-mentioned focal error and a tracking error.

[0076]The output of the optical head 53 is supplied to RF circuit 55. This RF circuit 55 is supplied to the decoder 71 of the reversion system which binary-izes a regenerative signal and mentions it later while it extracts the above-mentioned focus error signal and a tracking error signal from the output of the optical head 53 and supplies them to the servo control circuit 56.

[0077]The servo control circuit 56 comprises a focus servo control circuit, a tracking servo control circuit, a spindle motor servo control circuit, a thread servo control circuit, etc., for example. The above-mentioned focus servo control circuit performs focus control of the optical system of the optical head 53 so that the above-mentioned focus error signal may become zero. The above-mentioned tracking servo control circuit performs tracking control of the optical system of the optical head 53 so that the above-mentioned tracking error signal may become zero. Furthermore, the above-mentioned spindle motor servo control circuit controls the spindle motor 51 to rotate the magneto-optical disc 1 with predetermined revolving speed (for example, constant linear velocity). The above-mentioned thread servo control circuit moves the optical head 53 and the magnetic head 54 to the object track position of the magneto-optical disc 1 specified by the system controller 57. The servo control circuit 56 which performs such various control actions sends the information which shows the operating state of each part controlled by this servo control circuit 56 to the system controller 57.

[0078]The key-input-operations part 58 and the indicator 59 are connected to the system controller 57. This system controller 57 performs control of a recording system and a reversion system by the operational mode specified using the operational input information by the key-input-operations part 58. Based on the address information of the sector unit which is played with a header time, Q data of a sub-code, etc. from the recording track of the magneto-optical disc 1 as for the system controller 7, The recording position and playback position on the above-mentioned recording track which the optical head 53 and the magnetic head 54 are tracing are managed. Furthermore, the system controller 57 performs control to which regeneration time is displayed on the indicator 59 based on a data compression rate and the reproduction position information on the above-mentioned recording track. The system controller 57 concerned can perform processing by said CPU90, and does not need to provide said CPU90 in this case.

[0079]As opposed to the address information (absolute time information) of the sector unit by which the above-mentioned reproducing time display is played from the recording track of the magneto-optical disc 1 with what is called a header time, what is called sub-code Q data, etc., By carrying out the multiplication of the reciprocal (for example, the time of 1/4 compression 4) of a data compression rate, a actual hour entry is searched for and this is displayed on the indicator 59. When absolute time information is beforehand recorded, for example on recording tracks, such as a magneto-optical disc, at the time of record (preformatted), By reading this preformatted absolute time information and carrying out the multiplication of the reciprocal of a data compression rate, it is also possible to display a current position by the actual record time.

[0080]Next, in the recording system of the record reproduction machine of this disk recording playback equipment, the analog audio input signal AIN from the input terminal 60 is supplied to A/D converter 62 via the low pass filter 61. This A/D converter 62 quantizes the above-mentioned analog audio input signal AIN. The digital audio signals acquired from A/D converter 62 are supplied to the ATC(Adaptive Transform Coding) PCM encoder 63. The digital audio signals of above-mentioned A/D converter 62 are sent also to said CPU90. CPU90 at this time generates said index from the digital audio signals concerned, and sends it to the above-mentioned ATC encoder 63.
[0081]On the other hand, digital audio input signal DIN which contains an index in the input terminal 67 at least, for example from other main story rec/play student devices is supplied, and this input signal DIN is supplied to the ATC encoder 63 and the above-mentioned CPU90 via the digital input interface circuit 68. The CPU90 concerned at this time sends the data obtained by processing setting out etc. of the maximal value corresponding to the signal processing method at the time of record of this invention mentioned above using the above-mentioned index and digital audio signals to the above-mentioned ATC encoder 63.
[0082]As opposed to the time series sample data to which the encoder 63 was supplied via digital audio PCM data and the digital input interface circuitry 68 of a predetermined transfer rate which quantized the above-mentioned input signal AIN with above-mentioned A/D converter 62, Bit compression (data compression) processing is performed, and coding of said maximal value is also performed and these are sent to the memory 64. In the data compression in the above-mentioned encoder 63, although the compression ratio concerned is explained as 4 times, this example has this magnification with the composition for which it does not depend, and can be arbitrarily chosen by an application.
[0083]Next, writing and read-out of data are controlled by the system controller 57, and memorize temporarily the ATC data supplied from the ATC encoder 63, and the memory 64 is used as a buffer memory for recording on a disk if needed. That is, the compressed audio data in which high efficiency coding was made are reduced, for example by the ATC encoder 63 1/4 of the data transfer rate (75 sectors / second) of a CD-DA format with the standard data transfer rate, i.e., 18.75 sectors / second.
This compressed data is continuously written in the memory 14.
If one sector is recorded per four sectors when being compressed 4 times, as mentioned above, it is sufficient for this compressed data (ATC data), but since record of such every four sectors is next to impossible as a matter of fact, it is made to record sector continuation which is mentioned later. This record is burstily performed via a dormant period with the same data transfer rate (75 sectors / second) as a standard CD-DA format by making into a record unit the cluster which comprises predetermined two or more sectors (for example, 32 sector + number sector). That is, in the memory 14 concerned, the ATC audio information continuously written in with the low transfer rate of the 18.75 (= 75/4) sectors / second according to the above-mentioned bit compression rate is burstily read with the transfer rate of the above-mentioned 75 sectors / second as record data. within a time [of the recording operation burstily performed although the overall data transfer rate containing a record dormant period is a low speed of the above-mentioned 18.75 sectors / second about this data read and recorded], and an instant data transfer rate -- the above -- they are standard 75 sectors / second. Therefore, when it is the same speed (constant linear velocity) as the CD-DA format with standard disk rotational speed, record of the same storage density as a year worth CD-DA format and a memory pattern will be performed.
[0084]the record data of ATC audio information etc. burstily read from the above-mentioned memory 64 with the transfer rate (an instant ---like) of the above-mentioned 75 sectors / second is supplied to the encoder 65. Here, the unit by which continuous recording is carried out by one record in the data row supplied to the encoder 65 from the above-mentioned memory 64 is used as the number sector for cluster connection allotted to the front and back position of the cluster which comprises two or more sectors (for example, 32 sectors), and this cluster. This sector for cluster connection is set up for a long time than the interleave length in the encoder 65.
Even if it interleaves, he is trying not to affect the data of other clusters.

[0085]The encoder 65 performs coding processing (parity addition and interleave processing), EFM coding processing, etc. for an error correction about the record data burstily supplied as mentioned above from the memory 64. The record data in which coding processing by this encoder 65 was performed is supplied to the magnetic head driving circuit 66. The magnetic head 54 is connected to this magnetic head driving circuit 66. The magnetic head 54 is driven so that the modulation magnetic field according to the above-mentioned

record data may be impressed to the magneto-optical disc 1.

[0086]The system controller 57 controls a recording position to record continuously the above-mentioned record data burstily read from the memory 64 by this memory control on the recording track of the magneto-optical disc 1 while performing memory control like **** to the memory 64. The recording position of the above-mentioned record data burstily read from the memory 64 by the system controller 57 is managed, and control of this recording position is performed by supplying the control signal which specifies the recording position on the recording track of the magneto-optical disc 1 to the servo control circuit 56.
[0087]Next, the reversion system of this magneto-optical disc record reproduction unit is explained. This reversion system is for playing the record data continuously recorded by the above-mentioned recording system on the recording track of the magneto-optical disc 1.
the reproducing output obtained by tracing the recording track of the magneto-optical disc 1 by a laser beam by the optical head 53 -- RF circuit 55 -- a binary -- it has the decoder 71-izing [the decoder] and supplied.
At this time, not only a magneto-optical disc but read-out of the same optical disc only for playback what is called as compact Dix (CD:Compact Disc) can be performed.
[0088]The decoder 71 is a thing corresponding to the encoder 65 in an above-mentioned recording system, About the reproducing output binary-ized by RF circuit 55, decoding processing, EFM decoding processing, etc. like **** for an error correction are processed, and audio information etc. are reproduced with the transfer rate of 75 sectors / second earlier than a regular transfer rate. The regenerative data obtained by this decoder 71 is supplied to the memory 72.
[0089]Writing and read-out of data are controlled by the system controller 57, and the memory 72 is written in burstily [regenerative data / which is supplied with the transfer rate of 75 sectors / second from the decoder 71 / transfer rate / of 75 sectors / second of those]. This memory 72 is continuously read in the transfer rate 18.75 sector / second of 75 sectors / second when the above-mentioned regenerative data burstily written in with the transfer rate of the above-mentioned 75 sectors / second is regular.
[0090]The system controller 57 performs memory control which reads the above-mentioned regenerative data from the memory 72 continuously with the transfer rate of the above-mentioned 18.75 sectors / second while writing regenerative data in the memory 72 with the transfer rate of 75 sectors / second. The system controller 57 controls a playback position to play continuously the above-mentioned regenerative data burstily written in by this memory control from the memory 72 from the recording track of the magneto-optical disc 1 while performing memory control like **** to the memory 72. Control of this playback position manages the playback position of the above-mentioned regenerative data burstily read from the memory 72 by the system controller 57, It is carried out by supplying the control signal which specifies the playback position on the recording track of the magneto-optical disc 1 or the optical disc 1 to the servo control circuit 56.
[0091]The ATC audio information obtained as regenerative data continuously read from the above-mentioned memory 72 with the transfer rate of 18.75 sectors / second is supplied to the ATC decoder 73. This ATC decoder 73 reproduces 16-bit digital audio information by increasing the data extension (bit extension) of the ATC data of an audio 4 times, and it also performs decryption of said coded maximal value. The digital audio information from this ATC decoder 73 is sent to D/A converter 74 via the multiplication circuit 78, and it is sent also to said CPU90 and the data of the above-mentioned maximal value and an index is also further sent to this CPU90.
[0092]CPU90 at this time sends the data obtained by processing the multiplier determination corresponding to the signal processing method at the time of reproduction of this invention mentioned above using the above-mentioned index, the maximal value, and digital audio information, etc. to the multiplication circuit 78 or the level-control circuit 77. That is, in performing gain control to a regenerative signal in digital one and performing a multiplier in the above-mentioned multiplication circuit 78 in [again] analog, it sends the control signal of a variable resistor to the level-control circuit 77.
[0093]Here, when performing gain control in digital one, the multiplication of the multiplier from the above-mentioned CPU90 is carried out in the above-mentioned multiplication circuit 78, and this digital data in which gain control was performed in digital one is sent to D/A converter 74. This D/A converter 74 changes into an analog signal the digital audio information supplied from the ATC decoder 73. The output of this D/A converter 74 passes through the level-control circuit 77 as it is via the low pass filter 75, and is outputted from the output terminal 76 as analog audio signal AOUT to which gain control was performed in digital one. In

the composition which performs only this digital gain control, the level-control circuit 77 becomes unnecessary. The output of the above-mentioned multiplication circuit 78 can also be outputted from the terminal 80 as the digital audio output signal DOUT via the digitized output interface circuitry 79.
[0094]In performing gain control in analog, The above-mentioned multiplication circuit 78. [whether the digital audio information from the above-mentioned ATC decoder 73 is directly sent to D/A converter 74, without being provided, and] Or if the multiplication circuit 78 is formed, after the multiplication of 1 will be carried out as a multiplier to the digital audio information from the above-mentioned ATC decoder 73, it is sent to D/A converter 74. The analog signal from this D/A converter 74, After being sent to the level-control circuit 77 via the low pass filter 75 and performing gain control based on the control signal from said CPU90 in the level-control circuit 77 concerned, it is outputted from the output terminal 76 as analog audio signal AOUT.

[Translation done.]

* NOTICES *

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damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a flow chart showing the outline of the operation at the time of performing record or transmission of a signal with the signal processing method of this invention.
[Drawing 2]It is a block circuit diagram showing the composition of the important section of the signal processor of this invention example which performs record or transmission of a signal with this invention signal processing method.
[Drawing 3]It is a flow chart which expresses the outline of the operation at the time of reproducing a signal with this invention signal processing method and with which the flow of operation in the case of controlling a regeneration level in digital one especially is expressed.
[Drawing 4]It is a block circuit diagram showing the composition of the important section of the signal processor of this invention example which reproduces a signal with this invention signal processing method.
[Drawing 5]It is a flow chart which expresses the outline of the operation at the time of reproducing a signal with the signal processing method by this invention and with which the flow of operation in the case of controlling a regeneration level in analog especially is expressed.
[Drawing 6]It is a block circuit diagram showing the composition of the compressed data recording and reproducing device of the digital audio signals as one example in which the signal processor of this invention example is applied.
[Description of Notations]
201 Absolute value calculation circuit
203 Index decision circuit
204 Maximal value coding circuit
205 Maximum output circuit
206 Maximal value zero-clear circuit
207 Maximal value set part
208 Maximal value decision circuit
209 Maximal value substitution circuit
210 Signal coding part
211,249 input-sample buffer
212,250 sample-number decision circuit
213 Signal coding circuit
214 Sample buffer zero-clear circuit
215,253 Signal output circuit
242 Maximal value decoding circuit
243 Maximal value buffer
244 Maximal value detector circuit
247 Multiplier determining circuit
248 Signal decoding section
251 Signal decoding circuit
252 Time series sample multiplication circuit

[Translation done.]

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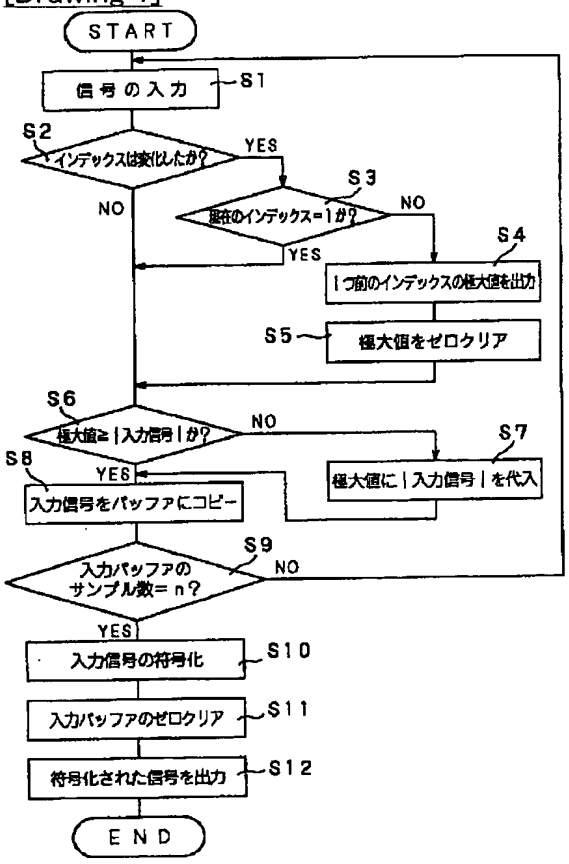
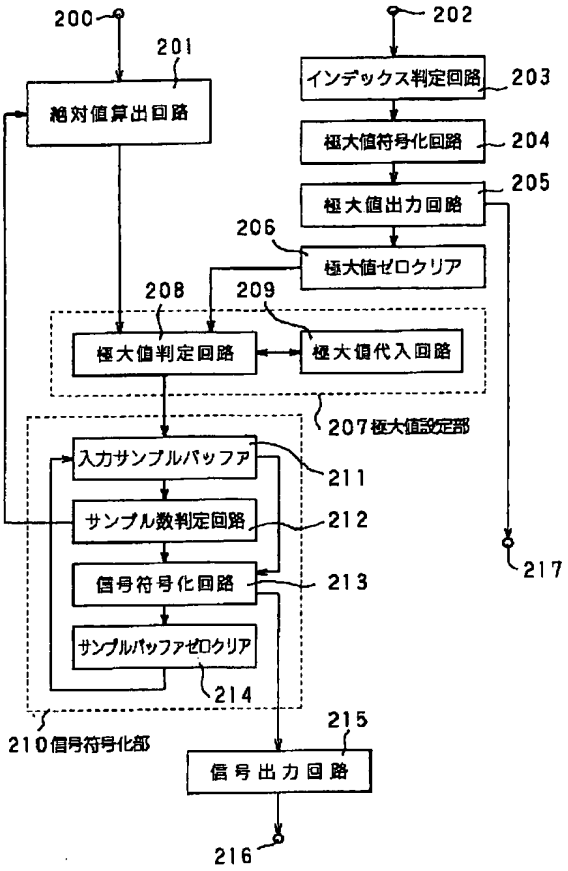
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

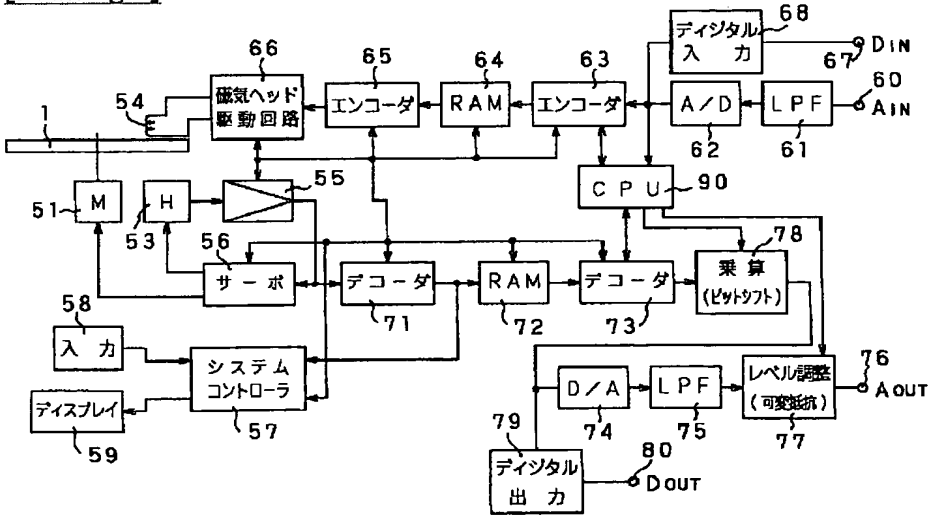
[Drawing 1]



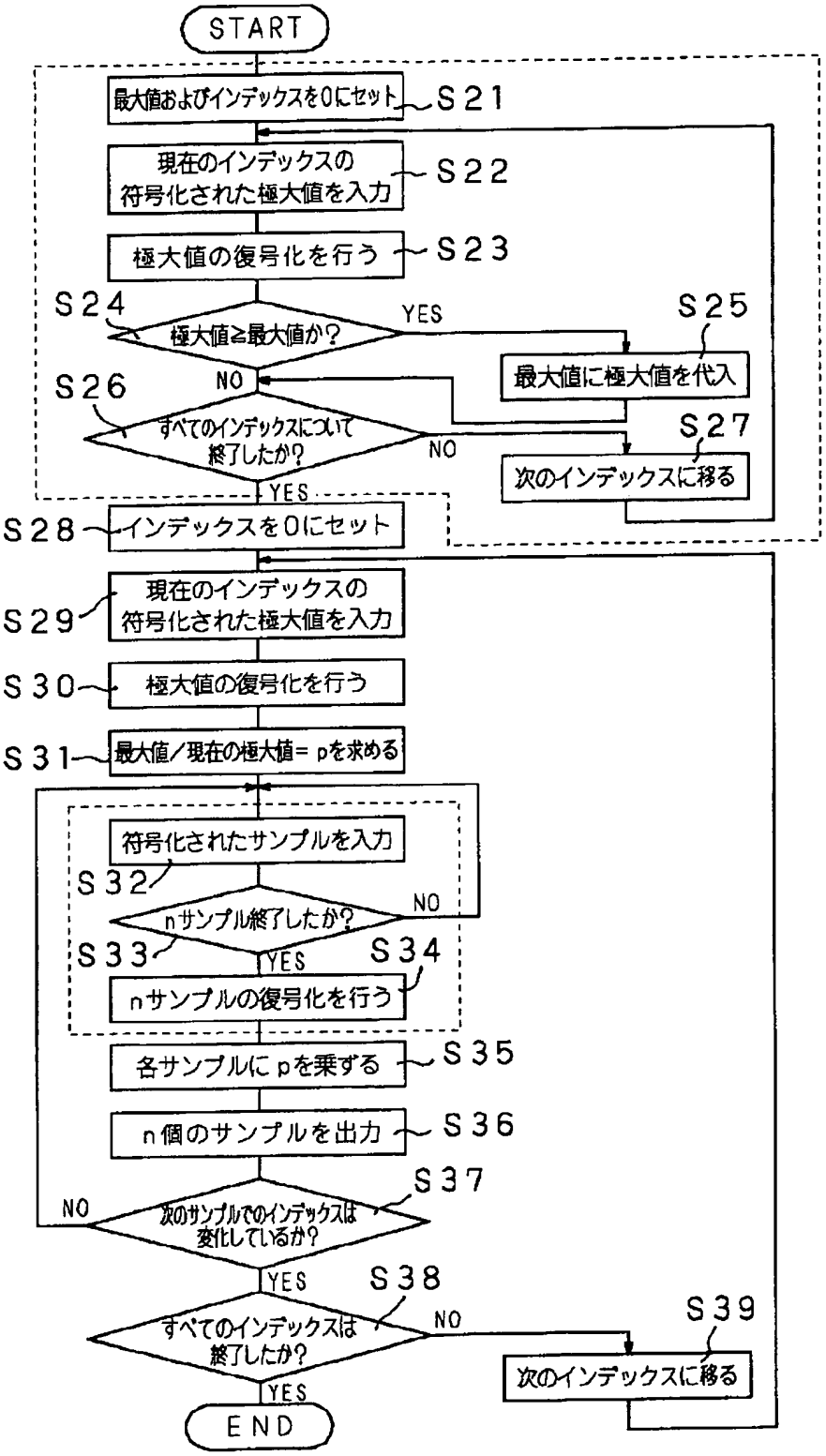
[Drawing 2]



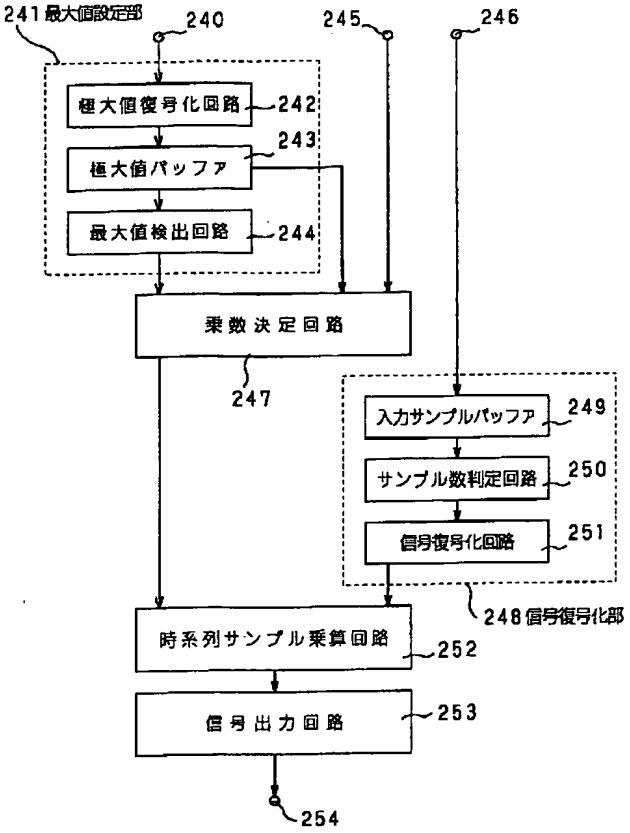
[Drawing 6]



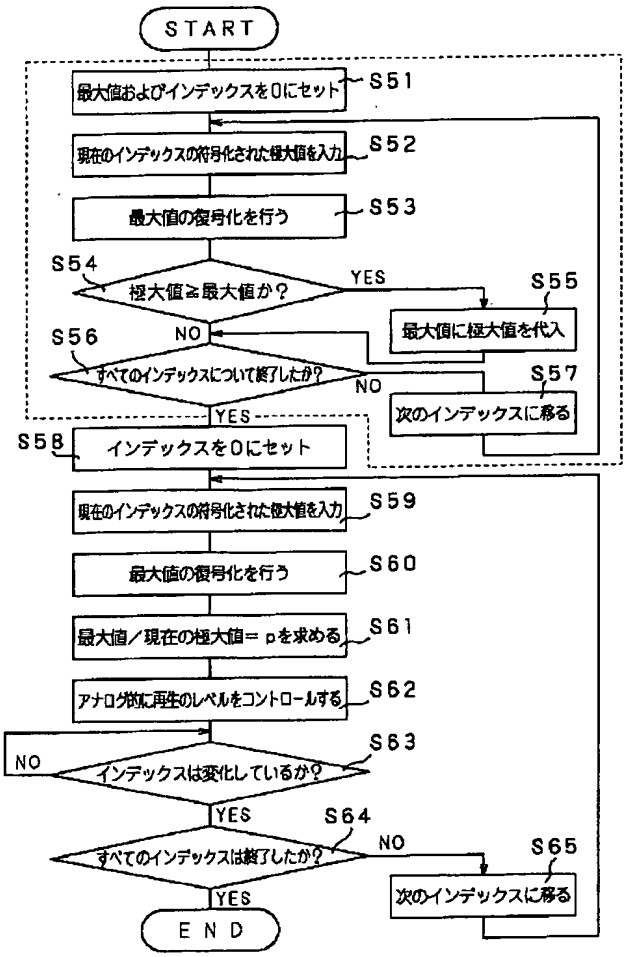
[Drawing 3]


START
最大値およびインデックスを0にセット
S21
現在のインデックスの符号化された極大値を入力
S22
極大値の復号化を行う
S23
S24
極大値≧最大値か?
YES
S25
最大値に極大値を代入
NO
S26
すべてのインデックスについて終了したか?
NO
S27
次のインデックスに移る
YES
S28
インデックスを0にセット
S29
現在のインデックスの符号化された極大値を入力
S30
極大値の復号化を行う
S31
最大値/現在の極大値= pを求める
符号化されたサンプルを入力
S32
nサンプル終了したか?
NO
S33
YES
S34
nサンプルの復号化を行う
各サンプルにpを乗ずる
S35
n個のサンプルを出力
S36
S37
NO
次のサンプルでのインデックスは変化しているか?
YES
S38
すべてのインデックスは終了したか?
NO
S39
次のインデックスに移る
YES
END

[Drawing 4]


241 最大値設定部
240
245
246
極大値復号化回路
242
243
極大値バッファ
最大値検出回路
244
乗数決定回路
247
入力サンプルバッファ
249
サンプル数判定回路
250
信号復号化回路
251
248 信号復号化部
時系列サンプル乗算回路
252
信号出力回路
253
254

[Drawing 5]



[Translation done.]

2-1

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	20/10	３２１	Z 7736－5D		
Ｈ０４Ｂ	14/04		C		

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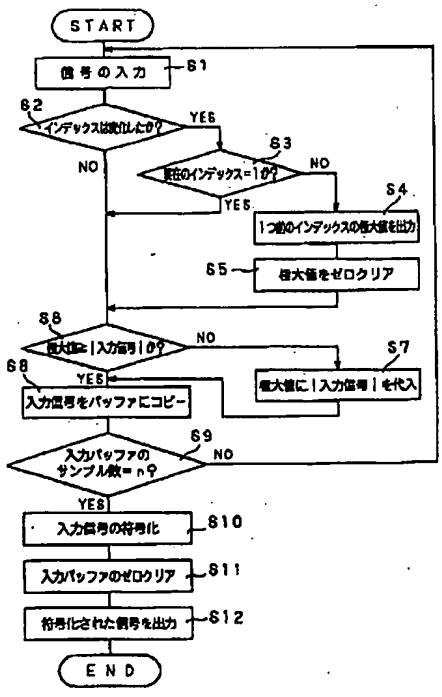
(54)【発明の名称】　信号処理方法及び装置、並びに信号記録媒体

(57)【要約】

【構成】　例えば複数のコンパクトディスクから得られた複数の曲からなる信号（実信号）の記録或いは伝送を行う際に、各曲の信号についての信号レベルの極大値を検出（ステップＳ２～ステップＳ７）し、この極大値を各曲の信号とともに記録或いは伝送する（ステップＳ８～ステップＳ１２）。再生時には、その極大値の最大値と再生する曲の信号の極大値とを比較し、再生する曲の信号の極大値の方が小さい場合には、自動的にその信号のレベルを最大値の信号のレベルと合わせて再生する。

【効果】　使用者は、再生時に各曲ごとの再生レベルの切り替え動作を行う必要がなくなり、したがって、使用者に対してより快適な使用環境を提供することが可能となる。



1

【特許請求の範囲】

【請求項1】　複数の部分信号からなる実信号の信号処理方法において、
複数の部分信号からなる実信号の各部分信号についての信号レベルの極大値を検出し、
上記実信号とともに各部分信号についての上記極大値を記録或いは伝送することを特徴とする信号処理方法。

【請求項2】　上記部分信号の絶対値の論理和を上記極大値の近似値として用いることを特徴とする請求項1記載の信号処理方法。

【請求項3】　記録或いは伝送される極大値に対して符号化を施すことを特徴とする請求項1又は2記載の信号処理方法。

【請求項4】　請求項1から請求項3のうちのいずれか1項に記載の信号処理方法を用いて処理された信号を記録してなることを特徴とする信号記録媒体。

【請求項5】　複数の部分信号からなる実信号の信号処理方法において、
複数の部分信号からなる実信号の各部分信号についての信号レベルの極大値を検出し、
符号化した実信号とともに各部分信号についての上記極大値を記録或いは伝送することを特徴とする信号処理方法。

【請求項6】　上記部分信号の絶対値の論理和を上記極大値の近似値として用いることを特徴とする請求項5記載の信号処理方法。

【請求項7】　記録或いは伝送される極大値に対して符号化を施すことを特徴とする請求項5又は6記載の信号処理方法。

【請求項8】　請求項5から請求項7のうちのいずれか1項に記載の信号処理方法を用いて処理された信号を記録してなることを特徴とする信号記録媒体。

【請求項9】　請求項1又は2記載の信号処理方法を用いて記録或いは伝送された信号を再生する信号処理方法であって、
記録或いは伝送がなされた複数の部分信号からなる実信号の再生に先立ち、各部分信号についての信号レベルの記録或いは伝送がなされた極大値の中での最大値を検出し、
当該検出した最大値を各部分信号の極大値で除した値を、実信号の再生時に各部分信号ごとに乗ずることを特徴とする信号処理方法。

【請求項10】　請求項3記載の信号処理方法を用いて記録或いは伝送された信号を再生する信号処理方法であって、
記録或いは伝送がなされた複数の部分信号からなる実信号の再生に先立ち、各部分信号についての信号レベルの記録或いは伝送がなされた符号化された極大値を復号化して、当該復号化した各極大値の中での最大値を検出し、

2

当該検出した最大値を各部分信号の極大値で除した値を、実信号の再生時に各部分信号ごとに乗ずることを特徴とする信号処理方法。

【請求項11】　請求項5又は6記載の信号処理方法を用いて記録或いは伝送された信号を再生する信号処理方法であって、
記録或いは伝送がなされた複数の符号化された部分信号からなる実信号の再生に先立ち、各部分信号についての信号レベルの記録或いは伝送がなされた極大値の中での最大値を検出し、
当該検出した最大値を各部分信号の極大値で除した値を、実信号の再生時に復号化した各部分信号ごとに乗ずることを特徴とする信号処理方法。

【請求項12】　請求項7記載の信号処理方法を用いて記録或いは伝送された信号を再生する信号処理方法であって、
記録或いは伝送がなされた複数の符号化された部分信号からなる実信号の再生に先立ち、各部分信号についての信号レベルの記録或いは伝送がなされた符号化された極大値を復号化して、当該復号化した各極大値の中での最大値を検出し、
当該検出した最大値を各部分信号の極大値で除した値を、実信号の再生時に復号化した各部分信号ごとに乗ずることを特徴とする信号処理方法。

【請求項13】　上記各部分信号に乗ずる乗数の近似値として、2のべき乗の値を用い、当該乗算としてビットシフトを用いることを特徴とする請求項9から請求項12のうちのいずれか1項に記載の信号処理方法。

【請求項14】　複数の部分信号からなる実信号の信号処理装置において、
複数の部分信号からなる実信号の各部分信号についての信号レベルの極大値を検出する検出手段を有し、
上記実信号とともに各部分信号についての上記極大値を記録或いは伝送することを特徴とする信号処理装置。

【請求項15】　上記部分信号の絶対値の論理和を上記極大値の近似値として用いることを特徴とする請求項14記載の信号処理装置。

【請求項16】　記録或いは伝送される極大値に対して符号化を施す符号化手段を設けることを特徴とする請求項14又は15記載の信号処理装置。

【請求項17】　複数の部分信号からなる実信号の信号処理装置において、
複数の部分信号からなる実信号の各部分信号についての信号レベルの極大値を検出する検出手段を有し、
符号化した実信号とともに各部分信号についての上記極大値を記録或いは伝送することを特徴とする信号処理装置。

【請求項18】　上記部分信号の絶対値の論理和を上記極大値の近似値として用いることを特徴とする請求項17記載の信号処理装置。

3

【請求項１９】　記録或いは伝送される極大値に対して符号化を施す符号化手段を設けることを特徴とする請求項１７又は１８記載の信号処理装置。

【請求項２０】　請求項１又は２記載の信号処理方法を用いて記録或いは伝送された信号を再生する信号処理装置であって、

記録或いは伝送がなされた複数の部分信号からなる実信号の再生に先立ち、各部分信号についての信号レベルの記録或いは伝送がなされた極大値の中での最大値を検出する検出手段と、

当該検出した最大値を各部分信号の極大値で除した値を、実信号の再生時に各部分信号ごとに乗ずる乗算手段とを有してなることを特徴とする信号処理装置。

【請求項２１】　請求項３記載の信号処理方法を用いて記録或いは伝送された信号を再生する信号処理装置であって、

記録或いは伝送がなされた複数の部分信号からなる実信号の再生に先立ち、各部分信号についての信号レベルの記録或いは伝送がなされた符号化された極大値を復号化して、当該復号化した各極大値の中での最大値を検出する検出手段と、

当該検出した最大値を各部分信号の極大値で除した値を、実信号の再生時に各部分信号ごとに乗ずる乗算手段とを有してなることを特徴とする信号処理装置。

【請求項２２】　請求項５又は６記載の信号処理方法を用いて記録或いは伝送された信号を再生する信号処理装置であって、

記録或いは伝送がなされた複数の符号化された部分信号からなる実信号の再生に先立ち、各部分信号についての信号レベルの記録或いは伝送がなされた極大値の中での最大値を検出する検出手段と、

当該検出した最大値を各部分信号の極大値で除した値を、実信号の再生時に復号化した各部分信号ごとに乗ずる乗算手段とを有してなることを特徴とする信号処理装置。

【請求項２３】　請求項７記載の信号処理方法を用いて記録或いは伝送された信号を再生する信号処理装置であって、

記録或いは伝送がなされた複数の符号化された部分信号からなる実信号の再生に先立ち、各部分信号についての信号レベルの記録或いは伝送がなされた符号化された極大値を復号化して、当該復号化した各極大値の中での最大値を検出する検出手段と、

当該検出した最大値を各部分信号の極大値で除した値を、実信号の再生時に復号化した各部分信号ごとに乗ずる乗算手段とを有してなることを特徴とする信号処理装置。

【請求項２４】　上記部分信号に乗ずる乗数の近似値として、２のべき乗の値を用い、当該乗算としてビットシフトを用いることを特徴とする請求項２０から請求項２３のうちのいずれか１項に記載の信号処理装置。

4

【請求項２５】　請求項１、２、５、又は６記載の信号処理方法を用いて記録或いは伝送された信号を再生する信号処理装置であって、

記録或いは伝送がなされた複数の部分信号からなる実信号の再生に先立ち、各部分信号についての信号レベルの記録或いは伝送がなされた極大値が供給される制御手段を有し、

当該制御手段は、上記極大値の中での最大値を検出し、各部分信号の極大値及び最大値に応じて、実信号の再生時に各部分信号ごとにアナログ的に再生レベルを制御することを特徴とする信号処理装置。

【請求項２６】　請求項３又は７記載の信号処理方法を用いて記録或いは伝送された信号を再生する信号処理装置であって、

記録或いは伝送がなされた複数の部分信号からなる実信号の再生に先立ち、各部分信号についての信号レベルの記録或いは伝送がなされた符号化された極大値が供給される制御手段を有し、

当該制御手段は、上記極大値を復号化し、当該復号化した各極大値の中での最大値を検出し、各部分信号の極大値及び最大値に応じて、実信号の再生時に各部分信号ごとにアナログ的に再生レベルを制御することを特徴とする信号処理装置。

【請求項２７】　請求項１、２、５、又は６記載の信号処理方法を用いて記録或いは伝送された信号を再生する信号処理装置であって、

記録或いは伝送がなされた複数の部分信号からなる実信号の再生に先立ち、各部分信号についての信号レベルの記録或いは伝送がなされた極大値及び当該各極大値の中での最大値を検出する検出手段と、

上記検出手段の検出出力が供給される制御手段とを有し、

当該制御手段は、各部分信号の極大値及び最大値に応じて、実信号の再生時に各部分信号ごとにアナログ的に再生レベルを制御することを特徴とする信号処理装置。

【請求項２８】　請求項３又は７記載の信号処理方法を用いて記録或いは伝送された信号を再生する信号処理装置であって、

記録或いは伝送がなされた複数の部分信号からなる実信号の再生に先立ち、各部分信号についての信号レベルの記録或いは伝送がなされた符号化された極大値を復号化する復号化手段と、

当該復号化手段の出力から当該各極大値の中での最大値を検出する検出手段と、

上記検出手段の検出出力が供給される制御手段とを有し、

当該制御手段は、各部分信号の極大値及び最大値に応じて、実信号の再生時に各部分信号ごとにアナログ的に再生レベルを制御することを特徴とする信号処理装置。

5

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、例えば音楽、音声等のディジタル信号を記録及び伝送或いは再生する際の信号処理方法及びその装置、並びに、この信号処理方法で処理された信号が記録される信号記録媒体に関する。

【0002】

【従来の技術】従来より、例えばいわゆるコンパクトディスク（CD）などの記録メディアに対して音楽や音声などの信号を記録（録音）する際には、通常、その録音のレベルは個々に異なっている。すなわち、複数枚のコンパクトディスクでは、各ディスク毎に記録された信号のレベルが異なっていることになる。

【0003】このため、例えば複数枚のコンパクトディスク（CD）などから再生した複数の音楽の曲などを、例えば記録再生が可能な1枚のディスクなどに記録した場合、上述のように各コンパクトディスクから再生された信号のレベルが異なっていたために、当該複数の曲を記録した1枚のディスクを再生する際には、使用者が曲毎に再生レベルを切り替え若しくは制御する必要がある。

【0004】

【発明が解決しようとする課題】すなわち、一般化して述べると、1つの記録媒体の内に記録された音楽や音声、若しくは1つの伝送媒体から伝送された音楽や音声が、いくつかの部分に分かれているとき（例えば曲毎に分かれているとき）、各部分ごとに記録或いは伝送されたレベルが異なっている場合には、その再生の際に各部分毎に再生レベルを切り替える必要がある。

【0005】したがって、使用者は、再生時にレベルの切り替え動作を頻繁に行わなければならず、操作が非常に繁雑になり、当該使用者の負担が増加している。

【0006】そこで、本発明はこの様な実情に鑑みてなされたものであり、複数の部分に分かれて記録或いは伝送された信号を再生する場合でも、使用者は再生レベルの切り替え動作を頻繁に行うことを必要とせず、効果的に再生レベルの切り替えを可能とする信号処理方法及び装置、並びに信号記録媒体を提供することを目的とするものである。

【0007】

【課題を解決するための手段】本発明は、上述の目的を達成するために提案されたものであり、本発明の信号処理方法は、複数の部分信号からなる実信号の信号処理方法であり、各部分信号についての信号レベルの極大値を検出し、上記実信号とともに上記極大値を記録或いは伝送することを特徴とするものである。ここで、記録或いは伝送する実信号や極大値は、符号化したものとすることができ、また、上記部分信号の絶対値の論理和を上記極大値の近似値として用いることができる。

【0008】次に、本発明の信号記録媒体は、上記本発明の信号処理方法によって処理された信号を記録してなるものである。

6

【0009】さらに、本発明の信号処理方法を用いて処理されて記録或いは伝送された信号を再生する信号処理方法では、上記記録或いは伝送時の信号処理方法に応じて、記録或いは伝送がなされた実信号の再生に先立ち、各部分信号についての信号レベルの記録或いは伝送がなされた極大値の中での最大値を検出し、当該検出した最大値を各部分信号の極大値で除した値を、実信号の再生時に各部分信号ごとに乗ずることを行う。また、記録或いは伝送がなされた極大値が符号化されているときには、実信号の再生に先立ち、上記符号化された極大値を復号化して、当該復号化した各極大値の中での最大値を検出し、その最大値を各部分信号の極大値で除した値を、実信号の再生時に各部分信号ごとに乗ずることを行う。さらに、符号化された実信号の再生に先立ち、各部分信号についての信号レベルの記録或いは伝送がなされた極大値の中での最大値を検出し、当該検出した最大値を各部分信号の極大値で除した値を、実信号の再生時に復号化した各部分信号ごとに乗ずる。またさらに、実信号と極大値が共に符号化されているときは、符号化された実信号の再生に先立ち、部分信号についての信号レベルの記録或いは伝送がなされた符号化された極大値を復号化して、当該復号化した各極大値の中での最大値を検出し、当該検出した最大値を各部分信号の極大値で除した値を、実信号の再生時に復号化した各部分信号ごとに乗ずることを行う。

【0010】さらに、本発明の信号処理方法では、上記各部分信号に乗ずる乗数の近似値として、2のべき乗の値を用い、当該乗算としてビットシフトを用いるようにすることもできる。

【0011】次に、本発明の信号処理装置は、複数の部分信号からなる実信号の信号処理装置であり、実信号の各部分信号についての信号レベルの極大値を検出する検出手段を有し、上記実信号とともに上記極大値を記録或いは伝送することを特徴とするものである。本発明の信号処理装置でも、記録或いは伝送する実信号や極大値は、符号化したものとすることができる。また、上記各部分信号の絶対値の論理和を上記極大値の近似値として用いることができる。

【0012】さらに、本発明の信号処理方法を用いて処理されて記録或いは伝送された信号を再生する信号処理装置は、記録或いは伝送がなされた実信号の再生に先立ち、各部分信号についての信号レベルの記録或いは伝送がなされた極大値の中での最大値を検出する検出手段と、当該検出した最大値を各部分信号の極大値で除した値を、実信号の再生時に各部分信号ごとに乗ずる乗算手段とを有する。こで、記録或いは伝送された極大値が符号化されているときの検出手段は、各部分信号についての信号レベルの符号化された極大値を復号化してからそ

の各極大値の中での最大値を検出する。また、記録或いは伝送された実信号が符号化されているときの乗算手段は、検出手段で検出した最大値を各部分信号の極大値で除した値を、実信号の再生時に復号化した各部分信号ごとに乗ずる。またさらに、実信号と極大値が共に符号化されているときには、検出手段において記録或いは伝送がなされた符号化された極大値を復号化して、当該復号化した各極大値の中での最大値を検出し、乗算手段において当該検出した最大値を各部分信号の極大値で除した値を、実信号の再生時に復号化した各部分信号ごとに乗ずる。

【００１３】本発明の信号処理装置においても、上記各部分信号に乗ずる乗数の近似値として、２のべき乗の値を用い、当該乗算としてビットシフトを用いるようにすることができる。

【００１４】また、本発明の信号処理方法を用いて処理されて記録或いは伝送された信号を再生する本発明の信号処理装置は、アナログ的に再生レベルを制御することもでき、例えば、記録或いは伝送がなされた実信号の再生に先立ち、各部分信号についての信号レベルの記録或いは伝送がなされた極大値が供給される制御手段を有し、当該制御手段は、上記極大値の中での最大値を検出し、各部分信号の極大値及び最大値に応じて、実信号の再生時に各部分信号ごとにアナログ的に再生レベルを制御する。また、このアナログ的に再生レベルを制御する信号処理装置には、各部分信号についての信号レベルの記録或いは伝送がなされた極大値及び当該各極大値の中での最大値を検出する検出手段を設け、制御手段では上記検出手段で検出された各部分信号の極大値及び最大値に応じて、実信号の再生時に各部分信号ごとにアナログ的に再生レベルを制御することもできる。

【００１５】さらに、アナログ的に再生レベルを制御する本発明の信号処理装置において、記録或いは伝送がなされる極大値が符号化されているときには、この符号化された極大値を制御手段に供給し、当該制御手段は、上記極大値を復号化し、当該復号化した各極大値の中での最大値を検出し、各部分信号の極大値及び最大値に応じて、実信号の再生時に各部分信号ごとにアナログ的に再生レベルを制御するものも考えられる。またさらに、符号化された極大値は、制御手段にきょうきやうする前に、復号化手段によって復号化することもでき、さらに検出手段で当該復号化手段の出力から当該各極大値の中での最大値を検出することで、制御手段は、この検出した極大値及び最大値に応じて、実信号の再生時に各部分信号ごとにアナログ的に再生レベルを制御するものとなる。

【００１６】

【作用】本発明の信号処理方法及び装置によれば、複数の部分部分信号からなる実信号の記録或いは伝送を行う際に、各部分信号についての信号レベルの極大値を検出し、この極大値を実信号とともに記録或いは伝送しておき、再生時に、その極大値の最大値と、再生する部分信号の極大値とを比較して、再生する部分信号の極大値の方が小さい場合には、自動的にその部分のレベルを最大値の部分信号のレベルと合わせて再生するようにしている。

【００１７】また、本発明の信号記録媒体によれば、各部分信号についての信号レベルの極大値をその実信号とともに記録してあるため、再生時のレベル制御にその極大値を用いることができるようになる。

【００１８】

【実施例】以下、本発明の好ましい実施例について、図面を参照しながら説明する。

【００１９】図１は、本発明の信号処理方法が適用される信号処理装置における信号の記録或いは伝送を行う際の動作説明を示すフローチャートである。この図１のステップＳ２からステップＳ９までが要部の動作の処理工程を表している。

【００２０】この図１において、最初のステップＳ１では、音声や音楽の時系列サンプルデータが実信号として入力される。ここでの信号の入力は例えば記録媒体からの読み取ったもの、或いは別の装置からの端子入力などでも良く、当該入力の方法は特に限定せず種々の方法が適用可能である。

【００２１】次のステップＳ２では、上記入力された時系列のサンプルデータが全体のうちの何番目の部分に含まれるものかを表すインデックスが、前のサンプルのときと変化したか否かを判定する。なお、このインデックスは、前記コンパクトディスクのＱデータフォーマットのインデックスと同様のものと考えることができ、したがって、上記部分としては例えば音楽の曲などのディジタル信号を例に挙げることができる。また、当該インデックスは、上記時系列サンプルデータの場合と同様に、どのような形で入力されているかの限定は特に行わない。このステップＳ２において、上記インデックスが変化していると判定した場合（イエス）には次のステップＳ３に、また変化していないと判定した場合（ノー）にはステップＳ６に進む。

【００２２】ステップＳ３では、現在のインデックスが“１”か否かを判定し、“１”であると判定した場合（イエス）にはステップＳ６に進み、“１”でないと判定した場合（ノー）にはステップＳ４に進む。

【００２３】ステップＳ４では、現在の１つ前のインデックスに対応する各サンプルデータすなわち部分信号の極大値を出力し、次のステップＳ５に進む。当該ステップＳ５においては、先に記憶していた極大値をゼロクリアしてステップＳ６に進む。

【００２４】次のステップＳ６では、記憶されている極大値を入力サンプルデータの絶対値と比較して、極大値の方が大きいか或いは等しい場合（イエス）にはステッ

プS８に進み、逆に極大値の方が小さい場合（ノー）にはステップS７に進む。

【００２５】ステップS７では、極大値に上記入力サンプルデータの絶対値を代入してステップS８に進む。なお、ここで極大値に入力サンプルデータの絶対値を代入する代わりに、入力サンプルデータの絶対値よりは小さくないが近い値である近似値を代入するようにしてもよい。

【００２６】次のステップS８では、入力サンプルデータを入力サンプルバッファにコピーして次のステップS９に進む。

【００２７】このステップS９では、上記入力サンプルバッファに蓄えられたサンプル数が符号化のために予め設定されたサンプル数ｎに対して等しいか否かを判定し、等しいと判定した場合（イエス）には次のステップS１０に、等しくないと判定した場合（ノー）にはステップS１に戻る。

【００２８】ステップS１０では、上記入力サンプルバッファに蓄えられた上記サンプル数ｎの各サンプルデータを用いて符号化を行い、次のステップS１１に進む。ここで、上記ｎは符号化の方法によって変わりｎ＝１として１サンプルずつ符号化することにしてもよいし、ｎを複数にしてこの複数のサンプルからなるブロックを符号化することにしてもよく、例えば後述するような圧縮符号化を用いることも可能である。また、ステップS１０の符号化を行わず、入力サンプルデータを直接記録或いは伝送することもでき、この場合には、上記ステップS８及びステップS９を省略するか或いは省略しないならばｎ＝１と考えるようにすればよい。なお、本実施例では、符号化を行う例について述べているが、上述のように符号化を行わないようにすることも考えられ、ここでは符号化の方法及び符号化を行うか否かについて特に限定を行わない。符号化を行わない場合には、後述するステップS１２において信号を出力する際に、入力信号すなわち実信号が直接出力されることとなる。

【００２９】上記ステップS１０の次のステップS１１では、使用された入力サンプルバッファ内のデータを全て０に置き換えて次のステップS１２に進む。当該ステップS１２においては、符号化された信号を出力し、その後、処理は終了する。なお、このステップS１２は、上記ステップS８及びステップS９を省略した場合には当然省略されることとなる。

【００３０】次に、図２には、本発明の信号処理方法が適用される本発明実施例の信号処理装置において記録或いは伝送を行う際の要部の構成を示す。

【００３１】この図２において、絶対値算出回路２０１は、端子２００より供給された実信号である時系列サンプルデータの絶対値を算出し、この絶対値を上記入力されたサンプルデータと共に極大値設定部２０７の極大値判定回路２０８に送る処理を行う。

【００３２】また、インデックス判定回路２０３には、上記入力されたサンプルデータが全体のうちのどの部分に含まれる信号かを表すインデックスのデータが、端子２０２を介して供給され、当該インデックス判定回路２０３では、当該インデックスが１つ前のインデックスと変わっていれば、そのインデックスを極大値符号化回路２０４に送る処理を行う。

【００３３】当該極大値符号化回路２０４では、上記端子２００からの入力サンプルデータから上記インデックスに対する極大値を検出してその供給された極大値を符号化してこれを出力し、これが極大値出力回路２０５に送られる。なお、この極大値符号化回路２０４における符号化の方法としては、例えば符号として極大値のビット数を用いるもの、或いは入力サンプルデータを符号化する際に使用する正規化係数等の様々なものが考えられるが、ここでは特に限定は行わない。また、当該極大値の符号化は、本発明において必須の条件ではないので、行わないものとしてもよい。前述した図１のフローチャートでは当該符号化を行わない例を示している。

【００３４】次の極大値出力回路２０５では、１つ前のインデックスに対応する各サンプルデータすなわち部分信号の処理によって得られた極大値を端子２１７を介して出力すると共に、極大値を出力した旨を示す識別信号を極大値ゼロクリア回路２０６に送る。

【００３５】当該極大値ゼロクリア回路２０６では、上記識別信号に応じて、極大値の記憶のために使用されているメモリをゼロクリアすると共に、極大値設定部２０７の上記極大値判定回路２０８に対して当該ゼロクリアした旨を示す識別信号を送る。

【００３６】上記極大値判定回路２０８では、１つ前のインデックスに対応する各サンプルデータまでの処理で得られた極大値と前記絶対値算出回路２０１からの絶対値出力とを比較して、上記極大値の方が大きい場合には上記絶対値算出回路２０１から送られた時系列サンプルデータ自身を信号符号化部２１０の入力サンプルバッファ２１１に送る。逆に、今回のサンプルデータの絶対値の方が大きい場合には、上記時系列サンプルデータを上記入力サンプルバッファ２１１に送るだけでなく、当該絶対値を極大値代入回路２０９に送る。

【００３７】当該極大値代入回路２０９では、極大値に割り当てられたメモリに対して、当該入力された絶対値が代入される。

【００３８】上記極大値判定回路２０７及び極大値代入回路２０９は、極大値を設定する極大値設定部２０７を構成するが、これらの処理の代わりに上記絶対値算出回路２０１の絶対値出力の論理和を取ってこの部分信号の極大値の近似値として出力することにしてもよい。

【００３９】次の信号符号化部２１０では、上記入力サンプルバッファ２１１に蓄えられたサンプル数のデータがサンプル数判定回路２１２に送られ、当該サンプル数

判定回路２１２では、符号化の為に予め設定された数ｎだけのサンプルデータが蓄えられているか否かを判定する。このサンプル数判定回路２１２において、上記入力サンプルバッファ２１１に蓄えられたサンプル数が必要なサンプル数ｎに満たないと判定した場合には、その旨を示す識別信号が絶対値算出回路２０１に送られ、これにより新たな入力サンプルについての上述した処理が行われる。また、サンプル数判定回路２１２において、入力サンプルバッファ２１１に必要なサンプル数が蓄えられていたと判定したときには、当該サンプル数判定回路２１２から信号符号化回路２１３に対してその旨を示す識別信号が送られる。

【００４０】当該信号符号化回路２１３では、当該識別信号が供給されると上記入力サンプルバッファ２１１から供給された上記サンプル数ｎのサンプルデータの符号化を行い、当該符号化したサンプルデータを信号出力回路２１５に送り、また、これらの処理が終了するとその旨を示す識別信号をサンプルバッファゼロクリア回路２１４に送る。

【００４１】上記サンプルバッファゼロクリア回路２１４では、上記信号符号化回路２１３からの上記処理の終了を示す識別信号が供給されると、上記入力サンプルバッファ２１１をゼロクリアする。

【００４２】上述の入力サンプルバッファ２１１、サンプル数判定回路２１２、信号符号化回路２１３、及びサンプルバッファゼロクリア回路２１４から信号符号化部２１０が構成されるが、サンプルデータの符号化を行わない場合にはこれらの構成要素は必要がなく、極大値判定回路２０８の出力が直接信号出力回路２１５に送られることとなる。

【００４３】上記信号出力回路２１５では、供給された符号化されたサンプルデータ（符号化を行わないときは当該符号化されていないサンプルデータそのもの）を外部の端子２１６等に出力して処理は終了する。

【００４４】次に、図３は本発明の信号処理装置において、信号の再生を行う際の動作を示すフローチャートである。この図３のステップＳ２１からステップＳ３９までが再生動作の処理工程を示している。

【００４５】この図３において、ステップＳ２１では、初期化として、極大値の最大値及びインデックスを０にセットして、次のステップＳ２２に進む。

【００４６】当該ステップＳ２２では、例えば記録媒体から再生若しくは送信されてきた現在のインデックスの各サンプルデータすなわち部分信号に対応する前記符号化された極大値の入力を行い、次のステップＳ２３に進む。このステップＳ２３では、上記符号化された極大値の復号化を行い、次のステップＳ２４に進む。なお、ここでの符号化及び復号化の方法については、前述した記録或いは伝送の動作の際と同様に特に限定は行わない。また、入力された極大値が符号化されていないデータの場合には上記ステップＳ２３は省略される。

【００４７】ステップＳ２４では、上記復号化された極大値（符号化が行われていない場合は当該符号化されていない極大値そのもの）を、それまでの極大値のうちの最大値と比較し、上記最大値よりも当該復号化された極大値の方が大きい場合（イエス）には次のステップＳ２５に進み、逆に最大値の方が大きい場合（ノー）にはステップＳ２６に進む。

【００４８】上記ステップＳ２５では、上記最大値を、当該復号化した極大値に置き換えて、次のステップＳ２６に進む。当該ステップＳ２６では、全てのインデックスについて上記処理が終了したか否かを判定し、終了していない場合（ノー）にはステップＳ２７で次のインデックスに移った後、ステップＳ２２に戻る。逆に、ステップＳ２６において、全てのインデックスについて上記の処理が終了していると判断した場合（イエス）には、次のステップＳ２８に進む。

【００４９】本実施例の信号処理装置では、以上のステップＳ２１からステップＳ２８において、再生がなされる再生信号（実信号）の全ての部分信号についての極大値の最大値を求めている。

【００５０】次に、ステップＳ２８では、改めて再生のためのインデックスを０にセットして、次のステップＳ２９に進む。このステップＳ２９では、現在のインデックスに対応する部分信号の上記符号化された極大値を入力した後、ステップＳ３０に進む。このステップＳ３０では、当該符号化された極大値を復号化する。なお、前述のように極大値が符号化されて記録或いは伝送されていない場合にはこのステップＳ３０は省略される。

【００５１】次のステップＳ３１では、前記ステップＳ２６で処理が終了した時点で、既に求められていた最大値をステップＳ２９で求められた極大値で割った値ｐを求め、その後ステップＳ３２に進む。

【００５２】ステップＳ３２では、上記符号化され記録或いは伝送されたサンプルデータの入力を行い、ステップＳ３３に進む。このステップＳ３３では、当該入力が復号化に必要なｎサンプル分だけ行われたかどうかを判定し、当該未だｎサンプル分の入力が終了していないと判定した場合（ノー）にはステップＳ３２に戻り、終了したと判定した場合（イエス）には次のステップＳ３４に進む。

【００５３】このステップＳ３４では上記ｎ個のサンプルデータの復号化を行い、次のステップＳ３５に進む。なお、ステップＳ３２からステップＳ３４までは、信号が符号化されて記録或いは伝送されている場合に必要となる工程であるため、信号が符号化されずに入力されたままの形で記録或いは伝送が行われている場合には省略される。

【００５４】次のステップＳ３５では、ステップＳ３４において復号された各サンプルデータにｐを乗じた後、

ステップＳ３６に進む。このステップＳ３６では、上記ステップＳ３５においてｐを乗じたｎ個のサンプルデータを出力してステップＳ３７に進む。

【００５５】このステップＳ３７では、次のサンプルに対応するインデックスの値が変化しているか否かを判定し、変化していないと判定した場合（ノー）にはステップＳ３２に戻って、さらに信号の復号化を続け、変化していたと判定した場合（イエス）にはステップＳ３８に進む。

【００５６】当該ステップＳ３８では、全てのインデックスに対応する部分信号についての上述の処理が終了したか否かを判定し、終了していないと判定した場合（ノー）には次のステップＳ３９に進み、当該ステップＳ３９でインデックスの値を１増加させた後、ステップＳ２９に戻る。一方、ステップＳ３８で処理が終了したと判定した場合（イエス）には信号再生の処理を終了する。

【００５７】次に、図４には本発明の信号処理方法を用いた信号処理装置の上記再生を行う構成を示す。

【００５８】この図４において、最大値設定部２４１の極大値復号化回路２４２では、前記本発明実施例の信号処理装置により検出され記録或いは伝送の際に符号化された極大値が、端子２４０等を介して入力され、ここで全てのインデックスに対応する部分信号についての当該符号化された極大値の復号化がなされ、その後極大値バッファ２４３に送られる。なお、前述のように極大値の記録或いは伝送の際に当該極大値が符号化されていなかった場合には当該極大値復号化回路２４２は省略され、その符号化されていなかった極大値が直接に極大値バッファ２４３に送られることになる。

【００５９】次の最大値検出回路２４４では、上記極大値バッファ２４３に蓄えられた全ての極大値のうちの最大値が検出され、当該最大値が乗数決定回路２４７に送られる。なお、ここでハードウェア規模等の制約がある場合などには、上記最大値を直接求める代わりに、当該最大値の近似値として全ての極大値の論理和を求めてこれに代えるようにしてもよい。

【００６０】次に、上記乗数決定回路２４７においては、端子２４５等を介して入力されたインデックスに対応する極大値バッファ２４３中の該当する極大値によって、上記最大値検出回路２４４から供給れれた最大値を除することにより、当該インデックスに対応する部分信号の各サンプルデータに対する乗数を算出する。なお、ここで当該乗数の近似値として２のべき乗の数を採用して、各サンプルデータに対する乗算を、当該各サンプルデータをビットシフトすることによって実現するようにしてもよい。

【００６１】また、端子２４６には再生された信号（サンプルデータ）が供給され、これが信号復号化部２４８の入力サンプルバッファ２４９に蓄えらる。次のサンプル数判定回路２５０では、上記入力サンプルバッファ２４９に対して復号化のために必要なサンプル数が蓄えられたか否かの判定を行う。当該サンプル数判定回路２５０において上記入力サンプルバッファ２４９に上記復号化に必要なサンプル数が蓄えられていたと判定した場合には、上記入力サンプルバッファ２４９に蓄えられていたサンプルデータが次の信号復号化回路２５１に送られ、ここで復号される。この信号復号化回路２５１の復号化によれ得られた時系列サンプルデータは、時系列サンプル乗算回路２５２に送られる。

【００６２】なお、前述のように信号の符号化が行われていない場合には、上記入力サンプルバッファ２４９、サンプル数判定回路２５０及び信号復号化回路２５１からなる信号復号化部２４８は省略され、端子２４６からの再生入力信号が直接時系列サンプル乗算回路２５２に送られることとなる。また、信号の符号化及び復号化方法についても本実施例は一定数のサンプルずつブロッキングして符号化する場合を例に挙げているが、フィルタ等のような非ブロッキング演算を用いて符号化する方法を採用してもよく、特に限定は行わない。さらに、上記極大値、インデックス、及び入力信号が入力される入力端子等は１つ或いは複数の端子でこれを行うことにしてもよい。

【００６３】時系列サンプル乗算回路２５２においては、上記乗数決定回路２４７からの乗数と、信号復号化回路２５１からの時系列サンプルデータとの乗算を行い、その結果の時系列サンプルデータ（上記乗数が乗算された時系列サンプルデータ）を信号出力回路２５３に出力する。なお、上述のように乗数として２のべき乗が採用されている場合には、上記時系列サンプル乗算回路２５２での乗算を、ビットシフトによって行うようにすることもできる。

【００６４】上記信号出力回路２５３では、上記乗算の行われた時系列サンプルデータを端子２５４等に出力して処理は終了する。

【００６５】次に、上述した図３及び図４においては、ディジタル的に再生信号のゲインのコントロールを行っているが、本発明はアナログ的に同様の処理を行う場合も含む。

【００６６】図５には、本発明の信号処理方法によって再生信号のレベルをアナログ的にコントロールする場合の動作を説明するフローチャートを示す。この図５のステップＳ５１からステップＳ６５までの動作が信号レベルをアナログ的にコントロールする動作の各工程を示している。また、ステップＳ５１からステップＳ６１までは、前記図３のステップＳ２１からステップＳ３１までと同様に、各部分信号についての極大値のうちで最大のものを検出し、各部分信号の極大値で該最大値を除した値を求めるものであるため、ここではその説明を省略する。

【００６７】この図５において、ステップＳ６２では、

15

前記図3のステップS31同様のステップS61で得られた値に応じて、アナログ的にレベルをコントロールする。この場合、ディジタル的にpを乗じることと同様の効果をもつようにするため、ディジタル／アナログ（D／A）変換後のアナログ回路の構成において再生のレベルを調節する処理を行う。

【0068】なお、ここでステップS62を構成として具体的に実現するには、例えばアンプにおいて信号のアッテネーションを可変抵抗によって制御しているときには上記pの値に応じて自動的に可変抵抗の接点を動かすようにするなどの構成が考えられるが、ここでは特に限定は行わない。

【0069】次のステップS63では、現在再生している部分信号のインデックスが変化しているか否かを判定して、変化していると判定した場合（イエス）には次のステップS64に進む。逆に、当該ステップS63において変化していないと判定した場合（ノー）には同じステップS63に戻り、次にインデックスが変化するまで同様の動作を繰り返す。

【0070】ステップS64では、全てのインデックスの部分信号についての処理が終了したか否かを判定し、終了していないと判定した場合（ノー）にはステップS65に進む。このステップS65においては、次のインデックスに移って、上記ステップS59からの処理を繰り返す。一方、ステップS64で全てのインデックスの部分信号について処理が終了していると判定した場合（イエス）には、この図5のアナログ的なレベルコントロールの処理を終了する。

【0071】上述したようなことから、本発明の信号処理方法及び装置においては、記録或いは伝送された複数の部分信号からなる実信号を再生する際に、再生時の使用者による各部分信号毎の再生レベルの切り替え動作を無くし、使用者の負担を軽減しつつ、効果的に再生レベルの切り替えを行うことが可能になる。

【0072】次に、図6には、上述した本発明の信号処理方法を実現する信号処理装置が適用される一具体例として例えばディジタルオーディオ信号を圧縮符号化して記録媒体に記録し、記録媒体から再生した信号を伸長復号化する圧縮データ記録再生装置の概略構成を示す。

【0073】この図6において、上述した本実施例の信号処理方法における極大値の設定や再生信号のゲインコントロールなどの制御は中央処理装置（CPU）90にて行われ、また前記極大値符号化回路204や信号符号化部210での符号化処理は例えばエンコーダ63において、さらに前記極大値復号化回路241や信号復号化部248での復号化処理などは例えばデコーダ73にて行われる。なお、極大値の符号化と復号化については、エンコーダ63，デコーダ73ではなく上記CPU90において行うようにすることもできる。さらに、前記時系列サンプル乗算回路252に対応する前記ディジタル

16

的なゲインコントロール（ゲイン調節）は乗算回路78において、アナログ的なゲインコントロール（ゲイン調節）はレベル調節回路77において行われる。

【0074】この図6に示す圧縮データ記録再生装置9において、先ず記録媒体としては、スピンドルモータ51により回転駆動される光磁気ディスク1が用いられる。なお、この光磁気ディスク1には、例えば直径が64mmの光磁気ディスクとして総称されるいわゆるミニディスク（MD）などを使用することができる。この光磁気ディスク1に対するデータの記録時には、例えば光学ヘッド53によりレーザ光を照射した状態で記録データに応じた変調磁界を磁気ヘッド54により印加することによって、いわゆる磁界変調記録を行い、光磁気ディスク1の記録トラックに沿ってデータを記録する。また再生時には、上記光磁気ディススク1の記録トラックを光学ヘッド53によりレーザ光でトレースして磁気光学的に再生を行う。

【0075】光学ヘッド53は、例えば、レーザダイオード等のレーザ光源、コリメータレンズ、対物レンズ、偏光ビームスプリッタ、シリンドリカルレンズ等の光学部品及び所定パターンの受光部を有するフォトディテクタ等から構成されている。この光学ヘッド53は、光磁気ディスク1を介して上記磁気ヘッド54と対向する位置に設けられている。光磁気ディスク1にデータを記録するときには、後述する記録系のヘッド駆動回路66により磁気ヘッド54を駆動して記録データに応じた変調磁界を印加すると共に、光学ヘッド53により光磁気ディスク1の目的トラックにレーザ光を照射することによって、磁界変調方式により熱磁気記録を行う。またこの光学ヘッド53は、目的トラックに照射したレーザ光の反射光を検出し、例えばいわゆる非点収差法によりフォーカスエラーを検出し、例えばいわゆるプッシュプル法によりトラッキングエラーを検出する。光磁気ディスク1からデータを再生するとき、光学ヘッド53は上記フォーカスエラーやトラッキングエラーを検出すると同時に、レーザ光の目的トラックからの反射光の偏光角（カー回転角）の違いを検出して再生信号を生成する。

【0076】光学ヘッド53の出力は、RF回路55に供給される。このRF回路55は、光学ヘッド53の出力から上記フォーカスエラー信号やトラッキングエラー信号を抽出してサーボ制御回路56に供給するとともに、再生信号を2値化して後述する再生系のデコーダ71に供給する。

【0077】サーボ制御回路56は、例えばフォーカスサーボ制御回路やトラッキングサーボ制御回路、スピンドルモータサーボ制御回路、スレッドサーボ制御回路等から構成される。上記フォーカスサーボ制御回路は、上記フォーカスエラー信号がゼロになるように、光学ヘッド53の光学系のフォーカス制御を行う。また上記トラッキングサーボ制御回路は、上記トラッキングエラー信

号がゼロになるように光学ヘッド５３の光学系のトラッキング制御を行う。さらに上記スピンドルモータサーボ制御回路は、光磁気ディスク１を所定の回転速度（例えば一定線速度）で回転駆動するようにスピンドルモータ５１を制御する。また、上記スレッドサーボ制御回路は、システムコントローラ５７により指定される光磁気ディスク１の目的トラック位置に光学ヘッド５３及び磁気ヘッド５４を移動させる。このような各種制御動作を行うサーボ制御回路５６は、該サーボ制御回路５６により制御される各部の動作状態を示す情報をシステムコントローラ５７に送る。

【００７８】システムコントローラ５７には、キー入力操作部５８や表示部５９が接続されている。このシステムコントローラ５７は、キー入力操作部５８による操作入力情報により指定される動作モードで記録系及び再生系の制御を行う。またシステムコントローラ７は、光磁気ディスク１の記録トラックからヘッダータイムやサブコードのQデータ等により再生されるセクタ単位のアドレス情報に基づいて、光学ヘッド５３及び磁気ヘッド５４がトレースしている上記記録トラック上の記録位置や再生位置を管理する。さらにシステムコントローラ５７は、データ圧縮率と上記記録トラック上の再生位置情報とに基づいて表示部５９に再生時間を表示させる制御を行う。なお、当該システムコントローラ５７が前記ＣＰＵ９０での処理を行うようにすることもでき、この場合は前記ＣＰＵ９０は設ける必要がない。

【００７９】上記再生時間表示は、光磁気ディスク１の記録トラックからいわゆるヘッダータイムやいわゆるサブコードQデータ等により再生されるセクタ単位のアドレス情報（絶対時間情報）に対し、データ圧縮率の逆数（例えば１／４圧縮のときには４）を乗算することにより、実際の時間情報を求め、これを表示部５９に表示させるものである。なお、記録時においても、例えば光磁気ディスク等の記録トラックに予め絶対時間情報が記録されている（プリフォーマットされている）場合に、このプリフォーマットされた絶対時間情報を読み取ってデータ圧縮率の逆数を乗算することにより、現在位置を実際の記録時間で表示させることも可能である。

【００８０】次に、このディスク記録再生装置の記録再生機の記録系において、入力端子６０からのアナログオーディオ入力信号ＡINは、ローパスフィルタ６１を介してＡ／Ｄ変換器６２に供給される。このＡ／Ｄ変換器６２は、上記アナログオーディオ入力信号ＡINを量子化する。Ａ／Ｄ変換器６２から得られたディジタルオーディオ信号は、ＡＴＣ（Adaptive Transform Coding）ＰＣＭエンコーダ６３に供給される。また、上記Ａ／Ｄ変換器６２のディジタルオーディオ信号は、前記ＣＰＵ９０にも送られる。このときのＣＰＵ９０は、当該ディジタルオーディオ信号から前記インデックスを生成して上記ＡＴＣエンコーダ６３に送る。

【００８１】一方、入力端子６７には、例えば他の本記録再生装置からの少なくともインデックスを含むディジタルオーディオ入力信号ＤINが供給され、この入力信号ＤINがディジタル入力インターフェース回路６８を介してＡＴＣエンコーダ６３及び上記ＣＰＵ９０に供給される。このときの当該ＣＰＵ９０は、上記インデックス及びディジタルオーディオ信号を用いて前述した本発明の記録時の信号処理方法に対応する極大値の設定などの処理を行い、得られたデータを上記ＡＴＣエンコーダ６３に送る。

【００８２】エンコーダ６３は、上記入力信号ＡINを上記Ａ／Ｄ変換器６２により量子化した所定転送速度のディジタルオーディオＰＣＭデータやディジタル入力インタフェース回路６８を介して供給された時系列サンプルデータに対して、ビット圧縮（データ圧縮）処理を行うと共に、前記極大値の符号化をも行い、これらをメモリ６４に送る。なお、上記エンコーダ６３でのデータ圧縮においては、当該圧縮率を４倍として説明するが、本実施例はこの倍率には依存しない構成となっており、応用例により任意に選択が可能である。

【００８３】次に、メモリ６４は、データの書き込み及び読み出しがシステムコントローラ５７により制御され、ＡＴＣエンコーダ６３から供給されるＡＴＣデータを一時的に記憶しておき、必要に応じてディスク上に記録するためのバッファメモリとして用いられている。すなわち、例えばＡＴＣエンコーダ６３によって高能率符号化がなされた圧縮オーディオデータは、そのデータ転送速度が、標準的なＣＤ－ＤＡフォーマットのデータ転送速度（７５セクタ／秒）の１／４、すなわち１８．７５セクタ／秒に低減されており、この圧縮データがメモリ１４に連続的に書き込まれる。この圧縮データ（ＡＴＣデータ）は、前述したように４倍に圧縮されていのときには４セクタにつき１セクタの記録を行えば足りるが、このような４セクタおきの記録は事実上不可能に近いため、後述するようなセクタ連続の記録を行うようにしている。この記録は、休止期間を介して、所定の複数セクタ（例えば３２セクタ＋数セクタ）から成るクラスタを記録単位として、標準的なＣＤ－ＤＡフォーマットと同じデータ転送速度（７５セクタ／秒）でバースト的に行われる。すなわち、当該メモリ１４においては、上記ビット圧縮レートに応じた１８．７５（＝７５／４）セクタ／秒の低い転送速度で連続的に書き込まれたＡＴＣオーディオデータが、記録データとして上記７５セクタ／秒の転送速度でバースト的に読み出される。この読み出されて記録されるデータについて、記録休止期間を含む全体的なデータ転送速度は、上記１８．７５セクタ／秒の低い速度となっているが、バースト的に行われる記録動作の時間内での瞬時的なデータ転送速度は上記標準的な７５セクタ／秒となっている。従って、ディスク回転速度が標準的なＣＤ－ＤＡフォーマットと同じ速度

（一定線速度）のとき、年甲斐ＣＤ－ＤＡフォーマットと同じ記録密度、記憶パターンの記録が行われることになる。

【００８４】上記メモリ６４から上記７５セクタ／秒の（瞬時的な）転送速度でバースト的に読み出されたＡＴＣオーディオデータ等すなわち記録データは、エンコーダ６５に供給される。ここで、上記メモリ６４からエンコーダ６５に供給されるデータ列において、１回の記録で連続記録される単位は、複数セクタ（例えば３２セクタ）から成るクラスタ及び該クラスタの前後位置に配されたクラスタ接続用の数セクタとしている。このクラスタ接続用セクタは、エンコーダ６５でのインターリーブ長より長く設定しており、インターリーブされても他のクラスタのデータに影響を与えないようにしている。

【００８５】エンコーダ６５は、メモリ６４から上述したようにバースト的に供給される記録データについて、エラー訂正のための符号化処理（パリティ付加及びインターリーブ処理）やＥＦＭ符号化処理などを施す。このエンコーダ６５による符号化処理の施された記録データが磁気ヘッド駆動回路６６に供給される。この磁気ヘッド駆動回路６６は、磁気ヘッド５４が接続されており、上記記録データに応じた変調磁界を光磁気ディスク１に印加するように磁気ヘッド５４を駆動する。

【００８６】また、システムコントローラ５７は、メモリ６４に対する上述の如きメモリ制御を行うとともに、このメモリ制御によりメモリ６４からバースト的に読み出される上記記録データを光磁気ディスク１の記録トラックに連続的に記録するように記録位置の制御を行う。この記録位置の制御は、システムコントローラ５７によりメモリ６４からバースト的に読み出される上記記録データの記録位置を管理して、光磁気ディスク１の記録トラック上の記録位置を指定する制御信号をサーボ制御回路５６に供給することによって行われる。

【００８７】次に、この光磁気ディスク記録再生ユニットの再生系について説明する。この再生系は、上述の記録系により光磁気ディスク１の記録トラック上に連続的に記録された記録データを再生するためのものであり、光学ヘッド５３によって光磁気ディスク１の記録トラックをレーザ光でトレースすることにより得られる再生出力がＲＦ回路５５により２値化されて供給されるデコーダ７１を備えている。この時、光磁気ディスクのみではなく、いわゆるコンパクトディクス（ＣＤ：Compact Disc）と同様な再生専用光ディスクの読み出しも行なうことができる。

【００８８】デコーダ７１は、上述の記録系におけるエンコーダ６５に対応するものであって、ＲＦ回路５５により２値化された再生出力について、エラー訂正のための上述の如き復号化処理やＥＦＭ復号化処理などの処理を行いオーディオデータ等を、正規の転送速度よりも早い７５セクタ／秒の転送速度で再生する。このデコーダ７１により得られる再生データは、メモリ７２に供給される。

【００８９】メモリ７２は、データの書き込み及び読み出しがシステムコントローラ５７により制御され、デコーダ７１から７５セクタ／秒の転送速度で供給される再生データがその７５セクタ／秒の転送速度でバースト的に書き込まれる。また、このメモリ７２は、上記７５セクタ／秒の転送速度でバースト的に書き込まれた上記再生データが正規の７５セクタ／秒の転送速度１８．７５セクタ／秒で連続的に読み出される。

【００９０】システムコントローラ５７は、再生データをメモリ７２に７５セクタ／秒の転送速度で書き込むとともに、メモリ７２から上記再生データを上記１８．７５セクタ／秒の転送速度で連続的に読み出すようなメモリ制御を行う。また、システムコントローラ５７は、メモリ７２に対する上述の如きメモリ制御を行うとともに、このメモリ制御によりメモリ７２からバースト的に書き込まれる上記再生データを光磁気ディスク１の記録トラックから連続的に再生するように再生位置の制御を行う。この再生位置の制御は、システムコントローラ５７によりメモリ７２からバースト的に読み出される上記再生データの再生位置を管理して、光磁気ディスク１もしくは光ディスク１の記録トラック上の再生位置を指定する制御信号をサーボ制御回路５６に供給することによって行われる。

【００９１】上記メモリ７２から１８．７５セクタ／秒の転送速度で連続的に読み出された再生データとして得られるＡＴＣオーディオデータは、ＡＴＣデコーダ７３に供給される。このＡＴＣデコーダ７３は、オーディオのＡＴＣデータを４倍にデータ伸張（ビット伸張）することで１６ビットのディジタルオーディオデータを再生すると共に、前記符号化された極大値の復号化をも行う。このＡＴＣデコーダ７３からのディジタルオーディオデータは、乗算回路７８を介してＤ／Ａ変換器７４に送られると共に、前記ＣＰＵ９０にも送られ、さらに、このＣＰＵ９０には上記極大値及びインデックスのデータも送られる。

【００９２】このときのＣＰＵ９０は、上記インデックス，極大値及びディジタルオーディオデータを用いて前述した本発明の再生時の信号処理方法に対応する乗数決定等の処理を行い、得られたデータを乗算回路７８やレベル調節回路７７に送る。すなわち、再生信号に対するゲインコントロールをディジタル的に行う場合には上記乗算回路７８に乗数を、またアナログ的に行う場合にはレベル調節回路７７に可変抵抗の制御信号を送る。

【００９３】ここで、ディジタル的にゲインコントロールを行う場合には、上記乗算回路７８にて上記ＣＰＵ９０からの乗数が乗算され、このディジタル的にゲインコントロールが施されたディジタルデータがＤ／Ａ変換器７４に送られる。このＤ／Ａ変換器７４は、ＡＴＣデコ

21

ータ７３から供給されるディジタルオーディオデータをアナログ信号に変換する。このＤ／Ａ変換器７４の出力は、ローパスフィルタ７５を介してレベル調節回路７７をそのまま通過し、ディジタル的にゲインコントロールが施されたアナログオーデイオ信号ＡＯＵＴ として出力端子７６から出力される。なお、このディジタル的なゲインコントロールのみを行う構成では、レベル調節回路７７は不要となる。また、上記乗算回路７８の出力は、ディジタル出力インタフェース回路７９を介し、ディジタルオーディオ出力信号ＤＯＵＴ として端子８０から出力することもできる。

【００９４】また、アナログ的にゲインコントロールを行う場合には、上記乗算回路７８は設けられずに上記ＡＴＣデコーダ７３からのディジタルオーディオデータが直接Ｄ／Ａ変換器７４に送られるか、又は乗算回路７８が設けられているならば上記ＡＴＣデコーダ７３からのディジタルオーディオデータに対して乗数として１が乗算されてから、Ｄ／Ａ変換器７４に送られる。このＤ／Ａ変換器７４からのアナログ信号は、ローパスフィルタ７５を介してレベル調節回路７７に送られ、当該レベル調節回路７７において前記ＣＰＵ９０からの制御信号に基づいてゲインコントロールが施された後、アナログオーデイオ信号ＡＯＵＴ として出力端子７６から出力される。

【００９５】

【発明の効果】上述したように、本発明の信号処理方法及び装置によれば、複数の部分信号からなる実信号の記録或いは伝送を行う際に、各部分部分についての信号レベルの極大値を検出し、この極大値を実信号とともに記録或いは伝送しておき、再生時にその極大値の最大値と、再生する部分信号の極大値とを比較して、再生する部分信号の極大値の方が小さい場合には、自動的にその部分信号のレベルを最大値の部分信号のレベルと合わせて再生するようにしているため、使用者は、各部分信号ごとの再生レベルの切り替え動作を行う必要がなく、したがって、使用者の負担を軽減しつつ、効果的に再生レベルの切り替えが可能になる。これにより、本発明の信号処理方法及び装置によれば、使用者に対して、より快適な使用環境を提供することが可能となる。

【００９６】また、本発明の信号記録媒体によれば、各部分信号についての信号レベルの極大値を実信号とともに記録してあるため、再生時のレベル制御にその極大値を用いることができ、したがって、使用者は、この信号記録媒体の再生時に、各部分信号ごとの再生レベルの切り替え動作が必要なく、使用者の負担を軽減しつつ、効果的に再生レベルの切り替えを行うことが可能になる。

22

【図面の簡単な説明】

【図１】本発明の信号処理方法により信号の記録或いは伝送を行う際の動作の概略を表すフローチャートである。

【図２】本発明信号処理方法により信号の記録或いは伝送を行う本発明実施例の信号処理装置の要部の構成を示すブロック回路図である。

【図３】本発明信号処理方法により信号の再生を行う際の動作の概略を表し、特にディジタル的に再生レベルのコントロールを行う場合の動作の流れを表すフローチャートである。

【図４】本発明信号処理方法により信号の再生を行う本発明実施例の信号処理装置の要部の構成を示すブロック回路図である。

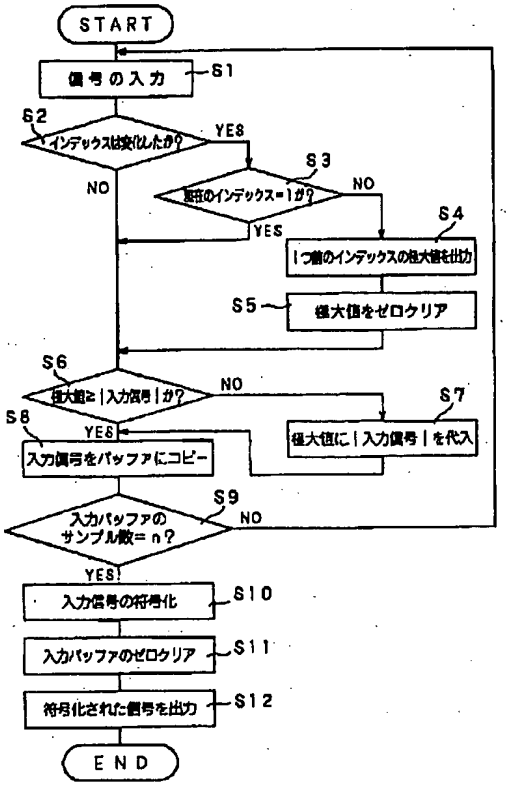
【図５】本発明による信号処理方法により信号の再生を行う際の動作の概略を表し、特にアナログ的に再生レベルのコントロールを行う場合の動作の流れを表すフローチャートである。

【図６】本発明実施例の信号処理装置が適用される一具体例としてのディジタルオーディオ信号の圧縮データ記録再生装置の構成を示すブロック回路図である。

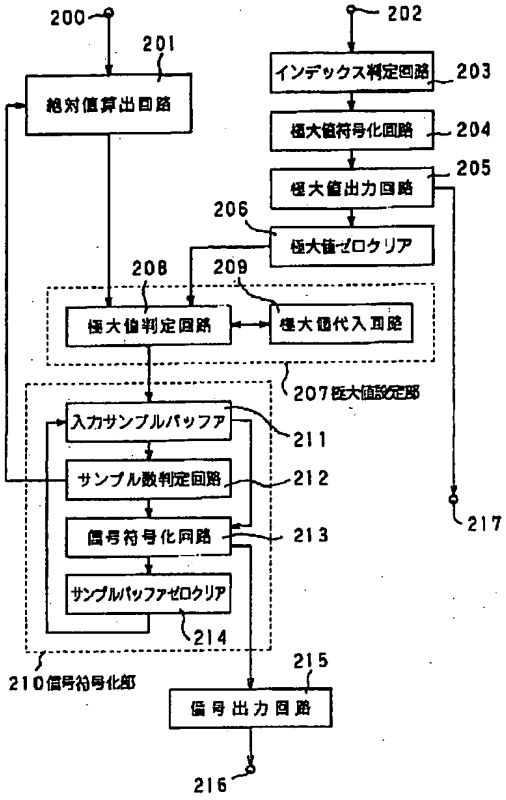
【符号の説明】

２０１　絶対値算出回路
２０３　インデックス判定回路
２０４　極大値符号化回路
２０５　最大値出力回路
２０６　極大値ゼロクリア回路
２０７　極大値設定部
２０８　極大値判定回路
２０９　極大値代入回路
２１０　信号符号化部
２１１，２４９　入力サンプルバッファ
２１２，２５０　サンプル数判定回路
２１３　信号符号化回路
２１４　サンプルバッファゼロクリア回路
２１５，２５３　信号出力回路
２４２　極大値復号化回路
２４３　極大値バッファ
２４４　極大値検出回路
２４７　乗数決定回路
２４８　信号復号化部
２５１　信号復号化回路
２５２　時系列サンプル乗算回路

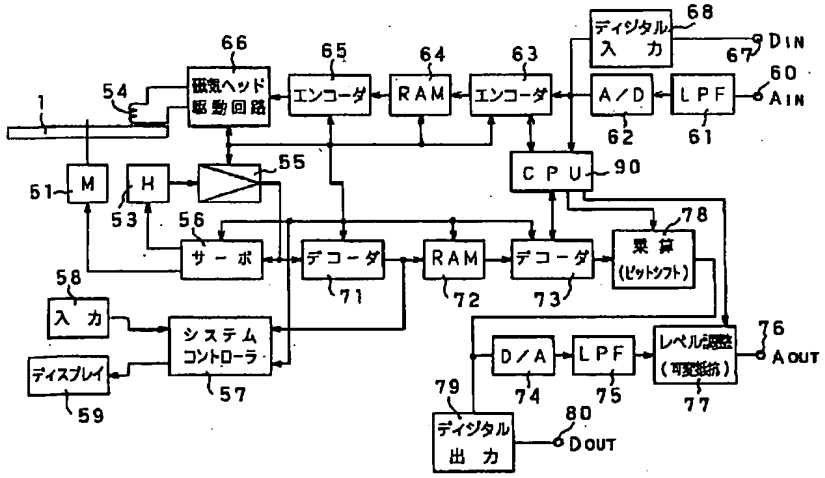
【図1】


START
信号の入力
S1
S2
インデックスは変化したか?
YES
NO
S3
最初のインデックス=1か?
NO
YES
S4
1つ前のインデックスの極大値を出力
S5
極大値をゼロクリア
S6
極大値<|入力信号|か?
NO
YES
S7
極大値に|入力信号|を代入
S8
入力信号をバッファにコピー
S9
入力バッファのサンプル数=n?
NO
YES
入力信号の符号化
S10
入力バッファのゼロクリア
S11
符号化された信号を出力
S12
END

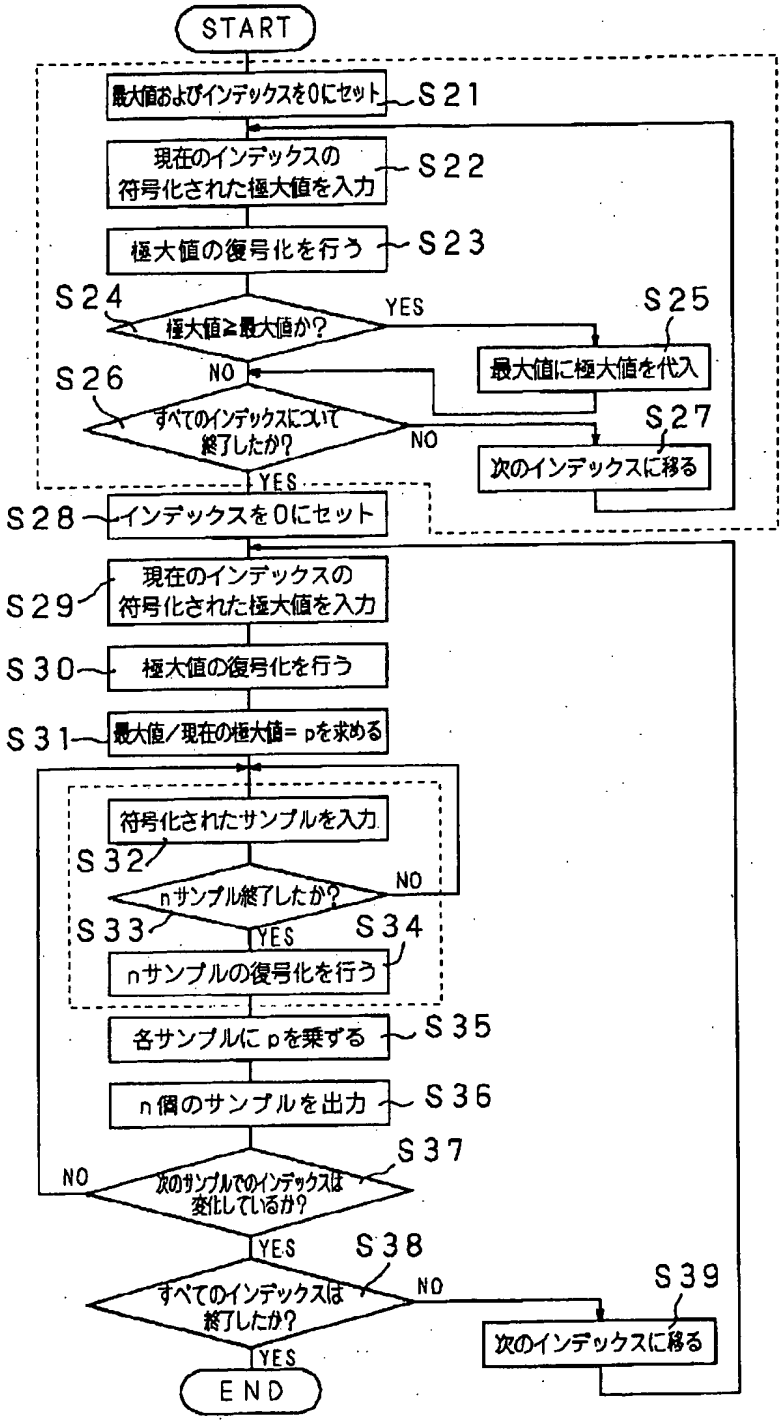
【図2】


200
201
絶対値算出回路
202
インデックス判定回路
203
極大値符号化回路
204
極大値出力回路
205
206
極大値ゼロクリア
208
209
極大値判定回路
極大値代入回路
207極大値設定部
入力サンプルバッファ
211
サンプル数判定回路
212
信号符号化回路
213
サンプルバッファゼロクリア
214
210信号符号化部
215
信号出力回路
216
217

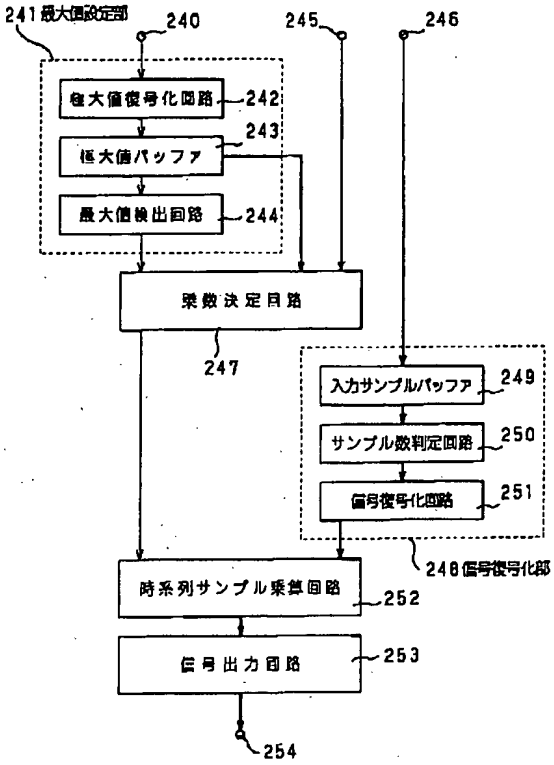
【図6】


ディジタル入力
68
DIN
67
60
AIN
磁気ヘッド駆動回路
66
エンコーダ
65
RAM
64
エンコーダ
63
A/D
62
LPF
61
1
54
M
51
H
53
55
CPU
90
78
サーボ
56
デコーダ
71
RAM
72
デコーダ
73
乗算(ビットシフト)
58
入力
システムコントローラ
57
ディスプレイ
59
D/A
74
LPF
75
レベル調整(可変抵抗)
77
76
AOUT
79
ディジタル出力
80
DOUT

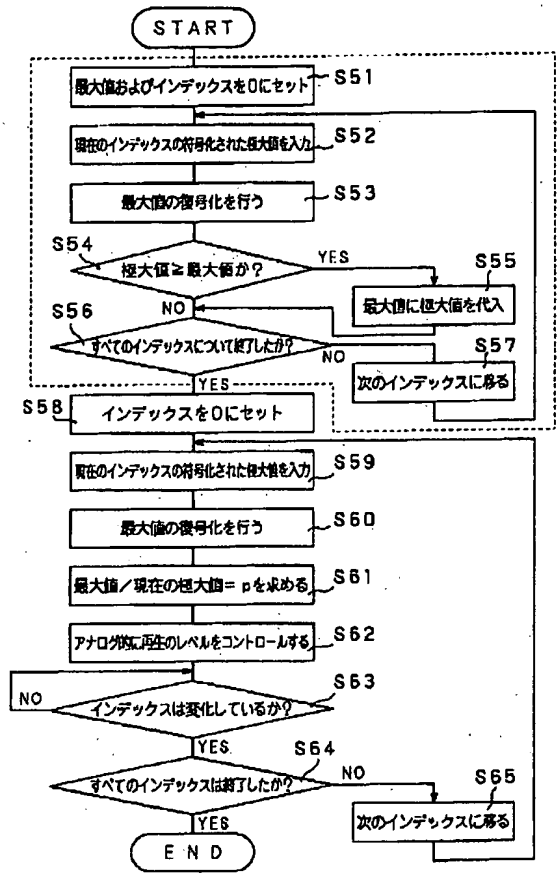
【図3】


START
最大値およびインデックスを0にセット
S21
現在のインデックスの符号化された極大値を入力
S22
極大値の復号化を行う
S23
S24
極大値≧最大値か?
YES
S25
最大値に極大値を代入
NO
S26
すべてのインデックスについて終了したか?
NO
S27
次のインデックスに移る
YES
S28
インデックスを0にセット
S29
現在のインデックスの符号化された極大値を入力
S30
極大値の復号化を行う
S31
最大値/現在の極大値= pを求める
符号化されたサンプルを入力
S32
nサンプル終了したか?
NO
S33
YES
S34
nサンプルの復号化を行う
S35
各サンプルにpを乗ずる
S36
n個のサンプルを出力
S37
NO
次のサンプルでのインデックスは変化しているか?
YES
S38
すべてのインデックスは終了したか?
NO
S39
次のインデックスに移る
YES
END

【図4】


241最大値設定部
240
245
246
極大値復号化回路
242
極大値バッファ
243
最大値検出回路
244
乗数決定回路
247
入力サンプルバッファ
249
サンプル数判定回路
250
信号復号化回路
251
248信号復号化部
時系列サンプル乗算回路
252
信号出力回路
253
254

【図5】


START
最大値およびインデックスを0にセット
S51
現在のインデックスの符号化された極大値を入力
S52
最大値の復号化を行う
S53
S54
極大値≧最大値か？
YES
S55
最大値に極大値を代入
NO
S56
すべてのインデックスについて終了したか？
NO
S57
次のインデックスに移る
YES
S58
インデックスを0にセット
現在のインデックスの符号化された極大値を入力
S59
最大値の復号化を行う
S60
最大値／現在の極大値＝pを求める
S61
アナログ信号に再生のレベルをコントロールする
S62
S63
NO
インデックスは変化しているか？
YES
S64
すべてのインデックスは終了したか？
NO
S65
次のインデックスに移る
YES
END